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Even Unto the Twelfth Generation — Huntington's Chorea*

JOHN TERRY MALTSBERGER**

GEORGE Huntington, a young man of parts freshly graduated from the College of Physicians and Surgeons, described the fearful disease which bears his name in 1872. Like many such scourges the chorea, or dance, has given rise to a series of legends and superstitions as its fateful saraband has twisted and turned through the ages. Is there a better way to begin an account of its history than with his recollection?

> I recall it as vividly as though it had occurred but yesterday. It made a most enduring impression upon my boyish mind, an impression every detail of which I recall today, an impression which was the very first impulse to my choosing chorea as my virgin contribution to medical lore. Driving with my father through a wooded road leading from East Hampton to Amagansett, we suddenly came upon two women, mother and daughter, both tall, thin, almost cadaverous, both bowing, twisting, grimacing. I stared in wonderment, almost in fear. What could it mean? My father paused to speak with them and we passed on. Then my Gamaliel-like instruction began; my medical education had its inception. From this point on my interest in the disease has never wholly ceased.[13]

Huntington's chorea is a progressive degenerative disease of the cerebrum with onset usually in middle life, inherited as a Mendelian dominant. It is characterized by the appearance of involuntary movements in the limbs and face, and ultimately, of the whole body, in association with a slowly progressive simple dementia.[7] Huntington himself said that it was confined to few families and

> has been transmitted to them, an heirloom from generations away back in the dim past. It is spoken of by those in whose veins the seeds of the disease are known to exist, with a kind of horror, and not at all alluded to except through dire necessity. . . . There are three marked peculiarities in this disease: 1. Its hereditary nature, 2. A tendency to insanity and suicide, 3. Its manifesting itself as a grave disease only in adult life.[12]

The origin of the disease, as Huntington says, is lost in the dim past. What is known about its history, however, will form the major portion of this paper; the more strictly medical details will be briefly taken up at the conclusion.

* Based on a paper read to the Boylston Medical Society at the Harvard Medical School on 22 October 1958.

** Boston Psychopathic Hospital, Boston.

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Huntington described the condition in 1872, but he was not the first physician to notice it. Huntington himself always insisted that the essential observations had been made by his father and his grandfather before him. Dr. Abel Huntington, the grandfather, first came to East Hampton, Long Island in the early 19th century, and it was during those days that the first notes for the Huntington family project must have been made. Detailed records were kept by Abel Huntington's son in turn, so that the grandson found a large part of the material waiting for his pen after his graduation from the College of Physicians and Surgeons in 1871. Bernt had reported hereditary chronic chorea in adults in 1810, and a letter from a physician named Waters had been published in 1842; Irving Lyon, a house officer at Bellevue, had written a brief description in 1863. These authors had not given full details, however, and it remained for Huntington to recognize dementia as an essential part of the process. The importance of his publication in 1872 was immediately recognized and the attention of European neurologists drawn to the Long Island families. The clear description and accurate details of Huntington's article entitled him to the recognition he subsequently received.

Many young men would have taken up an academic career after such an achievement. Perhaps realizing that the credit was not entirely his, he chose to follow his forebears into a general country practice. Long accustomed to leisure hours of fishing and hunting, perhaps he had seen enough of New York as a medical student to make city practice repugnant to him. He always spent much of his free time in the woods and regularly enjoyed sketching the animals and scenes he found there. We know that he was an amateur musician and much given to his family—there were five children. By all accounts he was an unusually sensitive, artistic man, with a well-developed sense of humor. There are hints that he held established religion in no particular reverence.

> There was a character on a neighboring farm by the name of Jim Kelly . . . who had such a brogue he could scarcely be understood. One Saturday night late Jim came to Dr. Huntington's office reeling drunk to have a laceration dressed on the top of his bald head. After he was cleaned up, the Doctor drew the wound together with a long strip of adhesive. Then he also placed a shorter strip across the first one near one of its ends to hold it in place, and he said, "Now Jim, this will get well all right because I have made the sign of the cross on you." This brought forth from Jim a burst of blasphemous language which included the Church, the State, and all the Protestants. "All right, Jim," said Dr. Huntington, while applying

another strip, "I've put another strip on here, making the letter H, which stands for Hell, and that is where you are going just as fast as rum can take you.[32]

Like many country doctors, Huntington was remembered by his patients for his kindness. A child in a poor family died of diphtheria. The father was sick and the mother beside herself with grief. Huntington built a coffin, arranged the child in it, and read the burial service at the grave in a private burial ground.[32]

After the publication of Huntington's description a number of neurologists became interested in tracing the disease back to its source. Carrying their investigations back from the East Hampton families, it was learned that three men and their wives, immigrants from Bures in Suffolk, were those who played the critical part in the beginning of an American tragedy. These people were members of the John Winthrop fleet, a group of some seven hundred passengers which set sail in eleven ships from Yarmouth on the Isle of Wight and put into Salem three months later, in the year 1630.

The early years of the 17th century were restless ones for England. King James I, "good natured, conceited, garrulous, . . . wise in booklearning but a poor judge of men," had little patience with Parliament and less with nonconformity. Petitioned by a group of nonconformists for some measure of toleration, he cried in 1604: "A Scottish Presbytery agreeth as well with a monarchy as God with the Devil. . . . No bishop, no king! . . . I shall make them conform themselves or I will harry them out of the land."[35] And this is precisely what he did. Charles succeeded to the throne after the death of his father in 1625. It was under him that Archbishop Laud, founder of the High Church party in the Church of England, redoubled the vigor with which the nonconformists were persecuted. Puritans were pouring out of England as fast as the ships could carry them. At the time it was considered a religious duty not only to hound Puritans, but also to extirpate those thought to be in league with the Powers of Hell.

At this time there was an aristocrat living in the village of Bures St. Mary, situated between Colchester and Sudbury in the County of Suffolk. His name was Herbert Pelham, he was a Puritan, and he was a Parliamentarian. Shortly before 1630 his wife had died; discouraged with the political and religious conditions prevalent in his district, he set sail for the colonies that year with Winthrop and his followers. With him came his children and two servants, Geoffrey Haste and a certain Nickolas, bastard son of Mary H. (Pre-

sumably this Mary was named Mary Haste, for Nickolas and Geoffrey Haste are known to have been half brothers.) Also in the fleet was William Knapp, son of a respectable middle class farming family. These three men brought their wives, and with them came Huntington's chorea.[5]

The marriage of Geoffrey Haste had been opposed by his parents for reasons that are not known, and in the face of family objection he and his bride ran away to America. They settled in Stamford, Connecticut. Little is known of Geoffrey, but he distinguished himself by signing, with several of his countrymen, harsh verdicts on his fellows. There was the case of a young man held responsible for the pregnancy of a young woman of doubtful habits. He was sentenced to be publicly whipped while pilloried and to have the letter R burned on his cheek. A fine of ten pounds was levied, to be paid to the girl's parents. This not being deemed sufficient, he was ordered to marry the girl as soon as he recovered. Stern judge that he was, Haste was later accused of having stolen a calf. One of Haste's sons, thought to have developed chorea, was charged with bestiality and sentenced to be publicly whipped. He was required by the authorities to wear a halter around his neck for one year. It is recorded that this son repented, became extremely religious, and begat many children who transmitted the terrible gene. Another male child, known by the pseudonym of Jefferson, grew up and settled in Greenwich, Connecticut, a town on the Dutch border, notorious for the immoral and vicious population it harbored. Jefferson married the daughter of Nickolas, that is, the daughter of his father's half-brother. From this marriage have sprung at least ten generations of choreic children.

Nickolas was in trouble with the law before the Winthrop fleet reached Boston Bay. Scurvy had developed among the passengers en route to America, and he had offered a medicine to cure it. Unfortunately for him, the authorities discovered that his drug was nothing more than water, and it was because of this that he was punished. Vessie states that his wife Ellin was hanged for witchcraft in 1653, which brings us to an interesting part of this chronicle.[36]

In the 17th century witchcraft was no petty matter. Did not the Connecticut settlers know full well what King Saul had risked in consulting the Witch of Endor? They may have disagreed with Archbishop Laud and his popish ideas, but respecting the language of Exodus there could be no mistake: "Thou shalt not suffer a witch to live."

The beginning of the witch persecutions in New England was not at Salem, as many commonly suppose. The nonconformists believed that the devil had come among them, and in great wrath, long before 1692. New Haven witnessed a witch scare near mid-century, and in 1642 the first antiwitchcraft laws were passed there, defining a witch as any who "hath or consulteth with a familiar spirit," prescribing death as the appropriate punishment. The first witch to be executed in New England was Margaret Jones, a Boston physician. She was said to have a malignant touch, and her medicines, the most extraordinarily violent effects. Those who refused her medicines she told they "would never be healed, and accordingly their diseases and hurts continued with relapse against the ordinary course." It is recorded that her behavior during trial "was intemperate, lying notoriously and railing upon the Jury and witnesses. In like distempter she died." This took place on 15 June 1648.[8]

The fundamental beliefs in witchcraft brought out in the Connecticut and Massachusetts trials were essentially the same as were held in contemporary England. Somehow an individual in the community, usually a woman, would be picked out as showing diabolical evidences. When some misfortune befell a citizen, the injured person, looking for a magical explanation, would raise the cry of witchcraft and accuse some likely culprit. Huntington's description of his childhood reaction comes back to mind: ". . .we suddenly came upon two women, mother and daughter, both tall, thin, almost cadaverous, both bowing, twisting, grimacing. I stared in wonderment, almost in fear. . . ."[13] Why should the reaction of this sensitive young man differ from that of a naïve and anxious citizen two hundred years his predecessor? "Be sober, be vigilant," commands the scripture, "because your adversary the devil, as a roaring lion, walketh about, seeking whom he may devour." Such imprecations stirred concern in a more faithful age.

To suspect a woman of witchcraft was to suspect she had been approached by the devil; once entreated and embraced by him she weakened under his persuasive efforts and signed her name in his book, usually in blood. This was tantamount to renouncing God and the Church, and yielding to the Prince of Hell, body and soul. The devil visits his witch at night, it was believed, often for the purpose of sexual intercourse. He claws and scratches her, leaving conspicuous marks on the skin. With the use of mysterious ointments, containing such things as aconite, soot, bat's blood, parsley,

poplar leaves, and baby's fat, she is enabled to fly through the night to participate in the Witches' Sabbath, from which the Black Mass is said to derive.

After the compact with the Devil is sealed, the witch undergoes certain bodily changes. She develops special nipples with which she gives suck to Hell's denizens. These monsters attach themselves to her body, usually hanging from the breasts and genitals. At the time of the compact the devil touches the witch's body, and a mark is left, often in the shape of a cloven hoof, sometimes the shape of a frog's or a rabbit's footprint, anaesthetic to all painful stimuli. It was therefore not unusual for suspects to be searched for supernumerary nipples or tags, or to have their sensation tested by running needles into suspected witch marks.

The witch is given command over certain imps who are dispatched to obey her orders. Through them she curses her enemies, causing them to die, provokes fits in children, kills hogs and cattle, and stirs up thunderstorms. But she is caught in the Devil's web, and she has but a short time. She is forced to submit to every conceivable temptation, from stealing to murder and even suicide, and in the end she is damned forever.

Perhaps at this point I should say that though we know of at least seven accused witches related to choreic families, Vessie, the authority in the matter, has not found uncontestable evidence that any of these had Huntington's chorea themselves. Numerous hints to that effect are, however, available. One witness described strange gymnastic performances at the trial of a certain Mary Staplies, and Cotton Mather speculated that certain ones of the colonial witches affected "a blasphemous imitation about our Saviour," suggesting a popular 17th century belief, namely, that the weaving motions, jerking backward and forward of the head, peculiar gesticulations and puckerings of the lips on the part of the choreics represented the suffering of Christ at the crucifixion, and that this affliction was a curse inherited by these victims from their forefathers, laid on by an angry God for their blasphemous presumption in daring to pantomime the agonies of the Saviour, passing now even unto the twelfth generation.

There is another suggestion that some of these witches were victims of Huntington's chorea. In Fairfield County, Connecticut, where the witch trials we are about to consider took place, there was a cabin in the woods called "the witch house." It was still standing in 1932, and its name derived from a choreic woman who had

been isolated there by her relatives, a woman whose fantastic muscular movements and fiery antagonism attracted considerable attention and provoked persecution.

With this much in mind, we may return to Ellin, the wife of Nickolas, who was executed in 1653, convicted of the Satanic trafficking I have outlined. The records are not very complete, but it is known that before her execution she had been examined by a group of women who took certain particulars of her anatomy for devils' nipples. This was proof enough that she had been giving suck to the demons, and they accordingly hanged her. As soon as she was cut down, a procession of curious women examined her body for evidences of witchcraft. There was one among them, Mary Staplies, who had the courage to assert that there were no "witches teates" to be found, and that if Ellin were a witch, then she too was guilty. She tried to get various women in the town to come and see for themselves, but for her troubles she too was charged with witchcraft. Mary is thought to have been related in some way, just how is not recorded, to Ellin. Perhaps the witch fever had begun to cool at the time, for Mary was acquitted in 1654 when she was brought to trial, and her accuser, Roger Ludlow, a deputy Governor, was fined £15 for his slander.

The acquittal was not enough to remove Mary from the reach of suspicion. In 1692 Mercy Disborough, the granddaughter of Nickolas and Ellin, and Goody Miller, known also as Elizabeth Clauson, were accused of witchcraft, and Mary Staplies was accused with them. The three, known at the time as "the weird sisters," were subjected to the usual physical examinations by the gynaecological experts:

> . . . as to goodwif Clauson forementioned wee found on her secret parts Just within ye lips of ye same growing within sid sumewhat as broad and reach without ye lips of ye same about on Inch and half long lik in shap to a dogs eare which wee apprehend to be unusuall to women.
>
> and as to marcy wee find on marcy foresayd on her secret parts growing within ye lep of ye same a los pees of skin and when puld it is near an Inch long somewhat in form of ye finger of a glove flatted that lose skin wee Judge more than common to women.

Mercy was held in particular awe by the populace. She frightened all who came near her, especially children. She was held to be powerful enough to cripple and kill cattle and to cause illness in humans. She was threatened with violence by terrified men. One man swore that she had threatened to tear him to pieces, and another complained that she told him "she would make him as

bare as a bird's tale." More than two hundred depositions were made in Mercy's trial, one of which bears quoting.

> I, David Selleck, watching with Catharine Branch, at the house of Daniel Westcott in company with Abraham Finch, doth testify, that in ye night when sd Katharine was in her fit, she looking off the bed, sayed, Gooddy Miller, hold up your arm hyer, that the black dog may such ye better. — — Again she sayed, Gooddy Miller, I never thot so much before now—I am sure you are a witch, for you have got a long **** under your arm. Then sd Katharine coming to herself wee asked her what she saw; she answered that she saw Gooddy Miller suckle a black dog, and that she had a long **** under her arme. Then I tuck the light in my hand and went out in the other rume upon some occasion, and passing tow or three times acros a rume, I heard ye sd Katharine screme out. Then I tuck ye light and went into ye rume and found Abraham Finch setting upon ye bed and sd Katharine lying across his feet. And seeing him look very pale, I asked what was ye matter; and he sayed that lying upon the bed he heard sd Katharine screme out, and looked up and saw a ball of fire as big as his tow hands pass a Long ye simmer to ye hearth and then vannishth away. Then after a small space, the sd Katharine came to herself and wee asked her what she saw when she scremed out. She sayed that she saw Gooddy Clawson come in with feiry eyes. Againe I leying upon the bed by ye sd Katharine and Abraham Finch, lying upon ye chest, I felt a priching in my side which caused me to start up: which Abraham Finch seeing, asked mee what was the matter. I told him yt I was pricht in ye side. Then the sd Katharine holding her hand over ye bed, sayde, Gooddy Miller give mee the thing that you pricht Mr. Selleck withall; then sheting her hand, Abraham Finch ketcht hold of her hand and wee found a pin in it: also, when she came to herself, and I asked her why she pricht me; she answered that she did not; and that it was Gooddy Miller.
>
> Standford, August 31, 1962 . . . Sworn in Court, September 15, —'92.
>
> John Allyn, Sec'y.[21]

With the tacit approval of Cotton Mather the water test was widely employed as an aid in the recognition of those New England witches tried at Salem. The test did not have the respect of most jurists and theologians of the period, and it was not admitted as evidence in the Salem trials. But the crowds of the curious used it for their own edification. A German schoolmaster, Scribonius, had been its greatest European advocate, and the theory of the test was that the witch, having renounced her baptism in making a compact with Satan, would float on water, for the Holy element would refuse to receive her. Archimedes' principle of specific gravity was not thought to apply. The test was most commonly practised by binding the thumbs and the great toes together with the arms crossed, and then letting or throwing the suspect into the water three times in a supine position. Those who floated were taken for witches, those who sank, for Christians.

We have the following testimony regarding the water trial of Mercy Disborough and Elizabeth Clauson:

> The testimony of Abram Adams and Jonath. Squire . . . is that when Mercy Disborow and Elizabeth Clawson were bound hand and foot and put into the water, they swam like a corck; and one labored to press them into the water, and they buoyed up like corck. Sworn in court, Sept. 15, 1692.
>
> Attest John Allyn, Secretary.[21]

For reasons that are not clear, Mary Staplies was not subjected to the trial by water. The outcome of this affair was the acquittal of Elizabeth Clauson and Mary Staplies, and the conviction of Mercy Disborough. Although Mercy was found guilty, she was probably never executed. Mary Staplies' daughter, Hannah Harvey, and her granddaughter, Hannah Harvey, were also tried and acquitted of the charge.

The celebrated Groton Witch, Elizabeth Knapp, was also descended from choreic stock. Her grandfather was William Knapp, the carpenter and one of the original three men from Bures in Suffolk. After his arrival in New England he settled in Massachusetts and according to colonial records was arrested several times for public profanity and speaking against the established government. William's third son, James, a choreic, married Elizabeth Warne who, after the birth of her daughter, the Groton witch, returned to Suffolk in England where she was arrested for and confessed to witchcraft. Affected Warne (Warren) descendents live in the Boston area today.

The Rev. Samuel Willard, minister of Groton, wrote a long letter to Cotton Mather in the autumn of 1671 about the strange behaviour of William's granddaughter.

> This poore & miserable object, about a fortnight before shee was taken, wee observed to carry herselfe in a strange & unwonted manner, sometimes shee would give sudden shriekes, & if wee enquired a Reason, would alwayes put it off with some excuse, & then would burst forth into imoderate & extravagant laughter, in such wise, as some times shee fell onto ye ground with it: I myselfe observed oftentimes a strange change in here countenance, but could not suspect ye true reason, but conceiued shee might bee ill, & yrfore divers times enquired how shee did it, & shee alwayes answered well; wch made mee wonder: but the tragedye began to unfold itself upon Monday, Octob. 30.71. . . .

I suspect that the tragedy had begun to unfold itself long before that Monday the Rev. Mr. Willard mentions. Listen to what was happening by Tuesday evening.

. . . ye rest of ye family being in bed, shee was . . . suddenly throne downe into ye midst of ye floore with violence, & taken with a violent fit, whereupon ye whole family was raised, & with much adoe was she kept out of ye fire fro destroying herselfe after wch time she was followed wth fits from thence till ye sabbath day; in which shee was violent in bodily motions, leapings, strainings & strange agitations, scarce to bee held in bounds by the strength of 3 or 4: violent alsoe in roarings & screamings, representing a dark resemblance of hellish torm^t^, & frequently using in thse fits divers words, sometimes crying out money, money, sometimes, sin & misery with other words.

It did not take long for Elizabeth, under the pastor's questioning, to admit that she had been receiving visits from Satan for three years; because she had refused to sign his book, it was believed, he was visiting his torments on her. The physician who was consulted at first attributed her condition to "foulnesse of her stomach, & corruptnesse of her blood, occasioning fumes in her braine, & strange fantasyes," but in time he "consented that ye Distemper was Diabolicall, refused further to administer, advised to extraordinary fasting; whereupon some of Gods ministers were sent for." Several more days passed. Mr. Willard continues:

. . . It had bin a question before, wither shee might p^r^ply bee called a Demoniacke, or pson possessed of ye Devill, but it was then put out of Question: hee began . . . by drawing her tongue out of her mouth most frightfully to an extraordinary length & greatnesse, & many amazing postures of her bodye; & then by speaking, vocally in her, whereupon her father & another neighbor were called fro ye meeting, on whom (as soon as they came in), he railed, calling them roagues, charging them for folly in going to heare a blacke roague, who told ym nothing but a pcell of lyes, & deceived them. . . After exercise I was called, but understood not ye occasion, till I came, & heard ye same voice, a grum, low, yet audible voice it was, ye first salutation I had was, oh! you are a great roague, I was at ye first somthing daunted & amazed, & many reluctances I had upon my spirits, which brought mee to a silence and amazement. . ., till at last God heard my groanes & gave me both refreshment in Christ, & corage: I then called for a light, to see whither it might not appeare a counterfiet, and observed not any of her organs to moove, ye voice was hollow, as it issued out of her throat; hee then agen called me great blacke roague, I challenged him to make it appear; but all ye Answer was, you tell ye people a company of lyes . . . I Answered, Satan, thou art a lyar, and a deceiver, & God will vindicate his owne truth one day: hee Answered nothing directly, but said, I am not Satan, I am a pretty blacke boy; this is my pretty girle . . . these manner of expressions filled some of ye company there present with great consternation, others put on boldnesse to speake to him, at which I was displeased, & advised them to see their call cleere, fearing least by his policy, & many apish expressions hee used, hee might insinuate himselfe, & raise in them a fearlessnesse of spirit of him. . .

For the time being the devil was quieted when the company began to pray, but Elizabeth continued her bizarre behavior.[9]

I do not know what finally happened to Elizabeth, the Witch of Groton, in the end. Cotton Mather mentions the case in *Magnalia Christi Americana:* "The chief things the goblin spoke were horrid railings against the godly minister of the town: but sometimes he belch'd out most nefandous blasphemies against the God of Heaven."[19]

Whether this was a case of demoniacal possession, hysteria, or Huntington's chorea will perhaps never be made out, but we do know that this girl's father was William Knapp's son, and that in all likelihood he was a choreic.

There has been considerable controversy among the witchcraft specialists with regard to the blame involved in the witchcraft trials. There was only one out of the seven witches accused with choreic connections who was put to death, and that was Ellin, the wife of Nickolas. Nineteen were executed at the Salem proceedings in 1692. During the whole 17th century there were about thirty executions for witchcraft in New England, and following 1692 there were no further known indictments. But the belief in witches persisted well into the 18th century. Samuel Johnson believed in witches, and such an eminent legal authority as Sir William Blackstone wrote in his Commentaries, 1765-1769, "To deny the possibility, nay, actual existence of witchcraft and sorcery, is at once flatly to contradict the revealed word of God. . . ."[9] In some quarters the belief persists to this day.

In 1597 King James I published a dialogue between two friends, Philomathes and Epistemon, entitled *Daemonologie*. Before leaving the subject of witchcraft I should like to quote him briefly. If as a ruler he suffered because of his Scottish origin, it proved no disadvantage to him as a scholar. James knew what he was talking about when he described witches, although he showed little circumspection in his ecclesiastic policies, as we have seen. King James recognized that there were difficulties in distinguishing cases of disease from cases of possession. This is what he has to say:

> There are divers symptoms whereby that heavy trouble witchcraft may be discerned from a naturall sicknesse & specially three, omitting the divers vain signs that the *Papistes* attributes unto it: Such as the raging at holie water, their fleeing a back from the Croce, their not abiding the hearing of God named & innumerable such like vain things that were alike fashious and feckles to recite. But to come to these three symptoms then, whereof I spake, I account the one of them to be the incredible strength of the possessed creature, which will farre exceed the strength of six of the wightest and wodest of any other men that are not so troubled. The next is the boldning up so far of the patients breast and bellie, with such an unnatural

sturring and vehement agitation within them: And such an ironie hardnes of his sinnowes so stiffelie bended out, that it were not possible to prick out as it were the skin of any other person so far. . . . The last is, the speaking of sundrie languages, which the patient is known by them that were acquainte with him never to have learned, and that with an uncouth and hollow voice, and all the time of his speaking a greater motion being in his breast then in his mouth. . . .[15]

Certain aspects of this description, namely, the great strength and speech with a minimum of mouth motion, suggest the Groton witch.

King James made some further observations, observations which, had they been noted in New England, would have saved much suffering. He claims that a distinction must be drawn between witches and melancholiacs.

. . . For as the humor of Melancholie in the selfe is blacke, heauie and terrene, so are the symptomes thereof, in any persones that are subject thereunto, leannes, palenes, desire of solitude: and if they come to the highest degree thereof, mere folie and *Manie:* where as by the contrarie, a great nomber of them that euer haue bene convict or confessors of Witchcraft, as may be presently seene by manie that haue at this time confessed: they are by the contrarie, I say, some of them rich and worldly-wise, some of them fatte or corpulent in their bodies, and most part of them altogether giuen ouer to the pleasures of the flesh, continual haunting of companie, and all kin of merrines, both lawfull and unlawfull, which are thinges directly contrary to the symptomes of Malancholie, whereof I spake, and further experience daylie proues how loath they are to confesse without torture, which witnesseth their guiltines, where by the contrary, the Melancholicques neuer spares to bewray themselues, by their continuall discourses, feeding therby their humor in that which they think no crime. . . .[15]

Few of the choreics could have been so gregarious and cheerful as the witches King James describes.

There were many other descendents of Geoffrey, Nickolas, and William that have not been described. William's granddaughter, another than Elizabeth of Groton, married a man named Mulfoot, and their descendents were those whom Huntington described at East Hampton, Long Island. Mrs. Amy Bassford, a resident of East Hampton for many years, has written me that the choreic families are still living in the vicinity, and that there is a new generation of children growing up there, approximately half of whom may be expected to develop the disease. The history of this disease is by no means over.

Cases of Huntington's chorea have been described not only in Caucasians, but in Negroes, Asiatics, and Indians. A recent survey in Michigan revealed 203 cases of the disease among 124 different

kinships, 41 per cent of which could trace the origin of the disease to ancestors outside the United States. There have been many immigrants since those who came with John Winthrop, and some have brought the seeds of the disease with them. The Michigan authors calculated an incidence of 1 case for every 24,000 persons in the population. If this figure is applied to the census data for 1957, there must be something over 7,000 cases of Huntington's chorea in the United States today.[30] Incidence calculations by other American writers agree closely.[26] Comparable incidences have been calculated for Northamptonshire[27,28] and Cornwall in England,[3] as well as for Victoria, Australia.[4] That the disease is not more common has caused some recent speculation among geneticists. If it is assumed that choreics reproduce as rapidly as the rest of the population, it should not take long for this malignant and dominant gene to replace its normal allele. That carriers of the gene have no difficulty in getting married has recently been shown, for the nonchoreic siblings of the Michigan choreics were not distinguishable from the general population in their marriage patterns. A preliminary report published in 1951 presented some evidence that choreics reproduce more rapidly than normal individuals,[29] but this has recently been challenged.[24] Just what is transpiring genetically remains to be seen.

The age of onset ranges from childhood to old age, but in most instances the disease first manifests itself in middle age. In a recent series the mean age at onset was calculated to be 35.30 ± 0.69 years with a standard deviation of 9.8 years.[30] Other authors are in close agreement.

Besides a hereditary nature, Huntington noted that his familial chorea was distinguished by a tendency toward insanity and suicide. Dementia is the most notable psychiatric change, but accompanying it, and usually preceding it by one or two years, are certain changes in personality. A person who has seemed reasonably even tempered may become unexplainably irritable and given to sudden, sometimes violent explosions of rage. A mild apathy with loss of interest in work, family, and friends often comes on early and may be associated with anxiety. A memory defect, at first mild, gradually insinuates itself and becomes more and more pronounced. More recent events are the ones most difficult to recall. The patient complains that he is unable to keep his attention fixed, and he may feel stupid or dull. Usually there is some insight into the difficulty in recalling. Judgment and insight fade, and finally the patient is

left an idiot, careless, dirty, and incontinent. Schizophrenic types of reaction are rare, but alcoholism is said to be common.[7]

Later writers agreed with Huntington that suicide occurred from time to time, but only recently have statistical methods been applied to test the claim. The suicide rate among noninstitutionalized choreics is significantly greater than that among their nonchoreic siblings.[30] There has been some difference of opinion as to why these patients are inclined to destroy themselves. Certainly in some instances the deciding factor has been the development of early choreic changes after a life filled with specific dread of that very event. Other patients have taken their lives in fits of pique; one woman, angry at her family, built a funeral pyre out of the furniture, ignited it, and flung herself into the flames.[14] This last kind of behaviour seems more a result of the disease than of its dread.

The somatic symptoms of Huntington's chorea are, in their mildest degree, difficult to distinguish from restlessness. Denny-Brown says that these patients do not keep still but move about, often grimacing, so that early on they may seem to suffer from a tic. Careful observation discloses, however, that the movements are not really as stereotyped as they are in the case of a tic, but within general limits present some variety of motion. Before the disease has become advanced extension and flexion at the fingers are often striking. This is exaggerated when the patient walks. Pouting of the lips with some tongue protrusion is common. Later on the disturbances of motion are more gross. The patient experiences severe difficulty in walking—he hesitates, his steps are unequal. He may lurch from side to side in an effort to keep his balance. Ultimately he is not able to walk at all. The arms are raised and lowered. The head moves about. Involuntary movements of these kinds are greatly aggravated by excitement, but the movements are not violent. They can easily be prevented by passive resistance.[7]

The most striking pathological change is the degeneration of the caudate nucleus. Many of the small neurons in this region are lost, while the larger ones are less affected. To a lesser degree the putamen is altered. Other structures of the basal ganglia are less affected. The cerebral cortex usually shows some diffuse atrophy, most pronounced in the deeper layers of the frontal lobes.

I have already said that there are probably some 7,000 cases of Huntington's chorea in the United States alone, so that the end of this tale must remain untold. But the tragic themes of this disease

are repeated over and over again. Members of the Huntingtonian families spend their early lives in fear of what is to come—years are clouded over with anxious anticipation of what may be in store. Families are decimated as a father or a mother develops the early signs of the disease. During the period when his children are growing up the parent falls prey and the process takes its toll, "more inexorable farre, Then emptie Tygers, or the roaring Sea." Among the victims have been university professors, common laborers, physicians, sailors, clergymen, and farmers.

Choreics and the husbands of choreic women are proportionately fewer among professional and semiprofessional workers but this does not hold for unaffected siblings whose occupational patterns are not distinguishable from the general population.[30] In some of these unaffected siblings the threat of disease still lies. Here is a case history.

> This 47-year-old physician was admitted to the hospital on October 14, 1928. His paternal grandmother had had Huntington's Chorea, and his father had died at the age of 25 of tuberculosis. The patient was graduated from High School at 16, taught in a country school for two years, and then studied medicine, obtaining his degree at the age of 23. While a medical student, he apparently brooded a good deal about the presence of Huntington's Chorea in his family, and he became addicted to morphine. Following his internship, he entered private practice and never remained more than two or three years in any one place. At various times he was addicted to morphine, and throughout his adult life he was a 'heavy drinker.' He never married. At the age of 44, he told a colleague that he was developing chorea and at about the same time he began to exhibit irritability. This symptom led to his hospitalization. On admission, he showed marked choreiform movements, defects in attention and immediate recall, could not do the serial sevens, but showed good insight. He remained in the hospital only 19 days and then insisted on leaving. Attempts at followup were unsuccessful and his subsequent course is not known. . . .[31]

Efforts have been made to predict which children of choreic stock are going to develop the disease, and the greatest enthusiasm seems to be electroencephalography. Very fast or slow low voltage frequencies with episodic bursts of slow activity and/or marked hyperventilation effect have been mentioned as indicators of choreic potential,[25] but Scandinavian[10] and English workers[18] have pointed out that this kind of pattern is not unusual in normal persons.

No definitive treatment has ever been developed, and the nature of the underlying process remains obscure. What Huntington wrote in 1872 is almost as true as ever:

I have never known a recovery or even an amelioration of symptoms in this form of chorea; when once it begins it clings to the bitter end. No treatment seems to be of any avail, and indeed nowadays its end is so well known to the sufferer and his friends that medical advice is seldom sought. It seems at least to be one of the incurables.[12]

In 1926 Eugene O'Neill wrote a play called *Strange Interlude,* concerning a family in which there was a hereditary disease not unlike Huntington's chorea. In it a mother tells her son's bride this story:

Mrs. Evans. I thought I was plain, but I'll be plainer. Only remember it's a family secret, and now you're one of the family. It's the curse on the Evanses. My husband's mother—she was an only child—died in an asylum and her father before her. I know that for a fact. And my husband's sister, Sammy's aunt, she's out of her mind. She lives on the top floor of this house, hasn't been out of her room in years, I've taken care of her. She just sits, doesn't say a word, but she's happy, she laughs to herself a lot, she hasn't a care in the world. But I remember when she was all right, she was always unhappy, she never got married, most people around here were afraid of the Evanses in spite of their being rich for hereabouts. They knew about the craziness going back, I guess, for heaven knows how long. I didn't know about the Evanses until after I'd married my husband. He came to the town I lived in, no one there knew about the Evanses. He didn't tell me until after we were married. He asked me to forgive him, he said he loved me so much he'd have gone mad without me . . . So I forgave him. I loved him an awful lot. . . We swore we'd never have children; we never forgot to be careful for two whole years. Then one night we'd both gone to a dance, we'd both had a little punch to drink, just enough—to forget—driving home in the moonlight![22]

The dance continues unabated. Medicine offers little more respite to its victims now than it did 88 years ago. For the families concerned it remains a curse, devilish, if you will, reaching unto the twelfth generation, and even beyond.

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The Optical Workshop Equipment of Giuseppe Campani

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ONE of the most unusual incidents in the history of science relates to the optical workshop equipment of Giuseppe Campani of Rome. Rarely is there to be found a similar instance in which a precious patrimony was painstakingly preserved only to be wantonly destroyed.

Giuseppe Campani (1635-1715) was one of the outstanding scientific figures of 17th century Europe. He was a mathematician and inventor of note, and he pioneered in the development of the telescope and microscope as well as the pendulum clock. The lenses and instruments which he produced excelled those of all other makers of his lifetime. Campani's patrons included Pope Alexander VII, Cardinal Flavio Chigi, Archduke Ferdinand II of Tuscany, Prince Leopold de Medici, the King of Poland, the King and Queen of Spain, the King of France, and the Landgrave of Hesse. When King Louis XIV established the astronomical observatory at Paris in 1669, he furnished it with the lenses and telescopes made by none other than Campani.

Relatively little is known about Campani's personal life. He was the youngest of three brothers who migrated to Rome from the tiny hamlet of Castel San Felice near Spoleto in about 1650. The oldest brother, the Rev. Matteo Campani degli Alimeni, was appointed pastor of a fashionable church in Via Parione, while the second brother, Pier Tommaso Campani, obtained employment as a clockmaker in the Vatican palaces. At this time Giuseppe was a boy in his teens and lived at the rectory with his brothers. Matteo Campani combined his priestly duties with a consuming interest in the physical sciences, and his avocation brought him into contact with members of the faculty of the Collegio Romano and other scientific figures. As a result of this association, young Giuseppe apparently received training in the optical sciences, possibly at the Collegio, but the details are not known.

In 1655 the brothers came to the attention of Pope Alexander VII by virtue of an ingenious silent night clock which they invented. The invention served to launch Giuseppe Campani in the scientific world, and his subsequent rise to fame was meteoric.

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The lenses and telescopes which he produced within the next decade surpassed in strength and excellence all others that were being made in Europe. The race for patronage led to open rivalry and bitter enmity with Eustachio Divini, another well-known lens and telescope maker who worked in Rome during the same period.[1] Widespread curiosity regarding the technical procedures he employed so successfully in the fashioning of his lenses caused Campani considerable distress. In order to protect his inventions and techniques, he became a recluse, working behind locked doors in his observatory in Montecitorio. Only his daughter was allowed into his workshop.

Campani was the father of three daughters, two of whom had died in early childhood from illness. He trained his surviving daughter in the techniques of his art, teaching her his secret methods and procedures of lens grinding and instrument making, and the theory of optics. It is traditionally reported that she achieved great skill, rivalled only by her father's perfection. When Campani died in 1715 at the age of 80, his daughter was his sole survivor and became heir to his equipment and other properties. Her life was surrounded by the obscurity which her father sought so constantly, and almost nothing is now known about her.

In 1746, three decades after Campani's death, his optical workshop equipment was purchased by the reigning pontiff, Pope Benedict XIV, and donated to the Institute of the Sciences at Bologna. The purchase was made from Campani's daughter with the Pope's personal funds, and the first record of the transaction occured in the *Chirografo* (Autograph Letter) of 6 May 1746. The purchase and donation of the equipment was an unparalleled pontifical act of preservation which reflected not only Campani's preeminence in the scientific world, but also the growing prominence of the Institute of the Sciences at Bologna. The Institute was a deserving beneficiary of the Pope's favors, for it had risen rapidly to rank among the foremost centers of learning in Europe by the mid-18th century.

[1] According to Poggendorf, "Divini had a rival in Rome, Giuseppe Campani. . . . This rival surpassed Divini in the construction of lenses and acquired great fame in this art, such great fame that upon his death Pope Benedict XIV purchased all his instruments and donated them to the Institute of Bologna. He (Campani) also constructed, at the request of Louis XIV, the lenses with which the celebrated astronomer, Domenico Cassini, discovered the two satellites nearest the planet Saturn. These were instruments having the colossal focal length of 86, 100 and 136 Paris feet. Divini succeeded only in making instruments having no more than 45 feet focal distance. . . ." Michel Angelo Ricci in a letter to Prince Leopold de Medici dated 18 August 1664 stated that ". . . these two savants maintain such a great rivalry that others cannot open their mouths in favor of one without the other becoming offended; therefore, everyone abstains from expressing an opinion. . . ."

The Institute of the Sciences was formally established in 1715—the year of Campani's death—by the Conte de Luigi Ferdinando Marsigli (1658-1730), a wealthy Bolognese geographer and naturalist. The founding of the Institute was the last great achievement in Marsigli's eventful career. A member of one of Bologna's old patrician families, he had been educated by the best teachers of his time, with emphasis on the sciences. He went on to a distinguished military career in the service of the Venetian Republic which terminated with unmerited dishonor after two decades, and he returned to retirement at Bologna. Conte Marsigli had pursued his scientific interests during his military service and he had collected many books, instruments, mechanisms, antiquities, and examples of rocks and minerals as well as plant and animal life.

After his retirement his home became the center for his many friends and acquaintances who shared his scientific interests. The gatherings at his home developed into an academy of experimenters who became known as the *Philosophi Inquieti.* In 1690 Marsigli bequeathed his home and laboratories to the University of Bologna to be perpetuated as the *Istituto delle Scienze* (Fig. 1). It was to be a research institute for public instruction, with emphasis on the teaching of practical science. In addition to a library and a laboratory, a physical cabinet and an observatory were established. A staff of five specialists was appointed, including an astronomer, librarian, chemist, mathematician, and experimental physicist. Six departments were formed in the Institute with one professor in charge of each. These included the departments of astronomy, chemistry, natural history, mathematics, experimental physics, and geography and nautical science. Marsigli's collection became an important addition to the Institute and formed a nucleus to which others were added. The Institute was considered to be unique as the first university laboratory to be established, and a rare instance of the adoption of the experimental method by a university in the 17th century.[2]

[2] During his military career in the service of the Venetian Republic, Conte Marsigli was sent to Constantinople in 1679 to investigate the conditions that existed amongst the Turkish forces. Later, in 1680, when the Turks threatened to invade Hungary, Marsigli offered his services to Emperor Leopold. He was wounded in action in 1683 and taken prisoner. His captors kept him enslaved until a ransom was paid eight months later. After the war ended, Marsigli was employed to arrange the boundaries between the Venetian Republic, Turkey, and the Holy Roman Empire. He saw action also in the War of the Spanish Succession and was the second in command at the fortress of Breisach when it was surrendered in 1703. Because the surrender of the fortress was considered unnecessary, his commanding officer was beheaded, and Marsigli was stripped of all honors and commissions. His appeals to the Emperor were in vain and he was dishonorably discharged. It was not until much later that he was vindicated by public opinion.

Pope Benedict XIV observed the birth and development of the new Institute with interest. He had been born in Bologna in 1675 with the given name of Prospero Lambertini. A member of one of the wealthy families, he had been educated at first by private tutors at home, then at the Collegium Clementinum at Rome. Although devoted to the study of science and history from his earliest years, he chose the Church as his career and advanced rapidly. He was created a Cardinal in 1728 and three years later, in 1731, he was appointed Archbishop of Bologna, his native city. He served in that capacity until he became Pope in 1740.

Pope Benedict's interest in science and history was reflected in many ways throughout his reign. He founded a number of museums and academies, and he established chairs for chemistry and mathematics and various arts in numerous schools. He was constantly surrounded by and corresponded with the greatest men of learning in his lifetime.[3] It is not surprising, therefore, that he maintained a lively interest in the educational institutions of his native city. He considered the various ways in which he could benefit the Institute of the Sciences, and the methods he chose were outlined in his *Motu proprio* (i.e., *By One's Own Accord*) of 28 November 1747. This administrative act of the Apostolic See was drawn up, personally signed and issued by the Pope of his own accord without the advice of others. In it he stated that in addition to his interest in public studies of his country's past, he was interested in the development of the Institute of the Sciences. When he first returned to Bologna as Archbishop, he found the Institute still in its formative stages and in need of many things. Despite this, with the appearance of published works by the faculty, the Institute acquired esteem and honor among the universities and scholars of Europe. This inspired Pope Benedict to imitate the examples of his predecessors, Popes Clement XI and Clement XII, to benefit the Institute from his own personal funds, not only in fulfillment of its immediate material needs but in the acquisition of desirable

[3] Pope Benedict XIV founded four academies at Rome for the study of Roman and of Christian antiquities, the history of the Church and its councils, and for the history of canon law and liturgy. He established a Christian museum and founded chairs of chemistry and mathematics at the Sapienza, as well as numerous others for painting, sculpture, and other subjects at other schools. He commissioned Joseph Assemani to compile a catalogue of the manuscripts in the Biblioteca Apostolica Vaticana, to which he added by the purchase of the Ottobonian Library of 3,300 manuscripts of prime importance. In addition to his donation of the Campani optical workshop equipment, the Pope gave a second collection to the Institute which included 37 antiquities such as lucerne, sepulchral urns, sacrificial equipment, candelabra, metallic artifacts, as well as a great number of mineral and marble specimens.

items and collections from Holland, England, France, Venice, and Rome which would be used to good purpose by the professors.

The *Motu proprio* further noted the lack of adequate materials and studies on the subject of anatomy, and the Pope accordingly encouraged the presentation of an annual lecture on the subject with suitable exhibits. For this purpose he commissioned Ercole Lelli (1702-1766) to create eight statues in wax to demonstrate the study of muscles and of bones. The statues were to be supplemented with proper explanatory tables. A room was to be set aside in the Institute to accommodate the statues in individual wall niches. Lelli was designated to be the custodian and exhibitor of this special Hall for the remainder of his natural lifetime. His successor was to be appointed by the Reggimento (city government). This would initiate the practice of naming a Professor to be in charge of each of the departments or halls of the Institute.

If and when Lelli were to be absent, or the position became otherwise vacant, the Assunteria of the Institute would submit the vacancy of the Custodianship to the Reggimento, and a suitable person would be selected by that body to fill the vacancy. The salary of the new custodian was to be established by the Assunteria and paid at the discretion of the Reggimento inasmuch as it would probably be difficult to find a suitable replacement.

The appointment of Ercole Lelli to such an important position by none other than the Pope himself was not surprising, for Lelli was a person of considerable note in Bologna.[4] As one of Italy's foremost painters, engravers and sculptors he worked in clay, wood, plaster, marble, and wax. In 1734 he produced two important écorchés in wood for the anatomical school of the University of Bologna. He next began to work in wax. Count Niccolò Aldrovandi commissioned him to create several anatomical figures in this medium, but the patron died before the project was finished. It was these figures that first brought Lelli to the attention of the Pope, while the latter was still Prospero, Cardinal Lambertini,

[4] Ercole Lelli was born in Bologna on 14 September 1702. As a boy he worked together with his brother, Antonio, as an arquebusier in his father's gunsmith shop in the Stra San Donato. The father, Domenico Lelli, was one of the most noted arquebusiers of his time. Ercole and Antonio Lelli were eventually both licensed as expert gun makers by the Holy Office. Ercole specialized in the decoration of the weapons produced in the shop. To improve himself in this special field, he undertook extensive studies of anatomy and drawing under the direction of Giovanni Pietro Zanotti. From these studies his interest led Lelli to more intensive investigation of anatomy art methods, and he eventually ventured even into the study of optics and other sciences. As a result, Lelli diverged from his work as an arquebusier to becoming one of Italy's foremost painters, engravers, and sculptors. In 1734 he was appointed engraver at the Papal Mint at Bologna by Pope Clement XII and retained the appointment until his death.

Archbishop of Bologna. Cardinal Lambertini conceived the idea of adding the series of waxen figures to the Hall of Anatomy of the Institute of the Sciences. Accordingly, when he became Pope in 1740 he commissioned Lelli to continue with the project, which was to be completed within six years at the Pope's own expense. The successful completion of the eight wax statues brought Lelli considerable prestige and he was appointed an Accademico Clementino. Furthermore, the eight statues were the primary reason for the issuance of the *Motu proprio* of 28 November 1747, which provided for the installation of the statues in the Institute of the Sciences.[5]

The same *Motu proprio* went on to state that the Pope had recently purchased the tools and complete workshop equipment of the deceased inventor of Rome, Giuseppe Campani, and that this collection was to be transported from Rome to Bologna, where it would be installed as an important and useful addition to the Institute. Ercole Lelli was to be entrusted with the custody of the collection, since he already possessed sufficient theoretical knowledge of the subject of optics and had practised the construction of dioptric glasses.

However, to reassure himself on the matter, the Pope reported that he had summoned Lelli to Rome. There Lelli had furnished adequate evidence of his ability to use Campani's instruments and had even produced works by means of them. As a matter of fact, he had immediately and in a brief period of time constructed a telescope with a focal length of 29 Roman Palms (i.e., 1 Palm was 8.79 inches), which not only turned out to the Pope's satisfaction but brought approbation of other persons well versed in the subject. Lelli was accordingly selected as custodian and exhibitor of the Campani optical workshop equipment as well as a collection of lathes previously donated to the Institute by its founder, General Marsigli.

The *Motu proprio* then delineated certain specifications for displaying the Campani optical workshop equipment and Lelli's responsibilities in regard to it:

[5] The full title of this document is translated from the Italian as follows: "*Motu proprio*, by means of which Ercole Lelli, Artificer of the eight Anatomical Statues which exist through the liberality of Our Holy Father, in the Institute of the Sciences, with other works representing the parts of the human body, became designated Custodian and exhibitor of said statues and said works, and furthermore of the collection of Dioptric Glasses also donated to the Institute by His Holiness, and of the Turning Lathes also, which were given by General Marsigli, *Pope Benedict XIV*."

Passing then to the orders which we desire should be maintained regarding the properties acquired by us from the daughter of the deceased Giuseppe Campana *(sic)*, and regarding their suitable use, the Senators of whom the Assunteria is composed, must consign to Lelli a suitable room which will be adaptable for the preservation of said properties, and towards this end we intend that there should be made ready wooden cabinets, bookshelves, tables and other furniture which might be required and all of these at our expense. In this room there shall furthermore be placed and preserved all such items as Lelli might make anew in lenses, instruments, machines and similar items, reserving those which might be of service in other rooms, which by the foregoing order should be consigned to the Assunteria. . . . If new discoveries or equipment are made elsewhere in the profession, the Assunteria should attempt to obtain them for Lelli's use, and it should be Lelli's responsibility to acquire them, but at no profit to himself. Lelli is to produce no work for an individual Professor's private use, and everything must be ordered from him in writing.

It is permitted to Lelli, because it is our wish, that he have the use of all properties acquired by us from the said Campani (*sic*), in order to perfect himself in the dioptric art, and to produce whatever work for profit or gain, and this also applies to the lathes donated by General Marsigli which should not be left idle. Finally, Lelli should be solicited that there should be added to the general inventories of the Institute not only the properties acquired by us from the daughter of the deceased Gioseppe Campana (*sic*) and donated as stated above to the Institute, but also all that he might create anew from his chambers and he should be ready to serve every wish of the Assunteria to render account of the properties, whether old or new, in his chambers as is the practice of all the other Professors. As Executors of this our wish, orders and disposition, which we desire that by all and singly, to whomever they pertain, should be inviolably observed, we deputize and nominate the Cardinal Legate and the Archbishop *pro tempore*, the Reggimento and the Assunteria of the Institute of our city of Bologna, giving to them for this purpose and to each of them the necessary faculty and opportunity, to be thus mindful of our precise wish.

In September 1747 the collection of optical tools and instruments from Campani's workshop were carefully inventoried and packed for shipment by the Abbate Uti, presumably a member of the Pope's staff. The collection was shipped from Rome to Bologna. There it was consigned directly to Ercole Lelli at the Institute on the 28th of September by Luigi Wood. The inventory made at this time before shipment was a carefully detailed document consisting of ten pages in the handwriting of the Abbate Uti and countersigned by Wood. In the Archives of State of Bologna there is also a summarized inventory, which listed the following:

14 metal moulds (patterns) for fashioning lenses and reducing them to convexity;

58 moulds and wheels of diverse metals for fashioning concave glasses;

66 holders of metal of various sizes for holding the glasses being fashioned;

46 small brass plates together with other brass equipment, the use of which is indicated thereon;

1 Machine of ingenious invention for fashioning concave glasses;

1 Bench of particular construction for fashioning the crystals with the utmost perfection;

6 turning Lathes, two of which are of considerable size, all of brass and worked with the greatest perfection; of the remaining four one is of wood and brass and the other three are partly of iron and partly of brass, all six being of special dioptrical use, in addition to wooden beams and bronzes for the construction of a great machine for working metallic forms of whatever proportion of a sphere, capable of achieving a sphere of 700 Palms and greater;

2 Machines for using object lenses of 100 and more Palms without the need for tubes;

13 items, including object lenses of various focal lengths from 36 Palms to 203 Palms.

How, when, or why the Pope's attention was directed to Campani's optical workshop equipment is not recorded. Pope Benedict was undoubtedly cognizant of Campani's achievements while he was still a student in Rome and during subsequent contacts with the scientific world. There seems to be some significance in the fact that Pope Benedict did not purchase the Campani collection at an earlier date, although he had previously acquired and donated other collections to the Institute at Bologna and other institutions of learning in Italy. The assumption is that the Campani equipment was not made available for sale until the time of its purchase in 1746, and furthermore, that Campani's daughter placed it on the market directly or through an intermediary.

The donation of the Campani workshop equipment to the Institute of the Sciences excited considerable interest in the scientific world. In Paris, for instance, the excellence of Campani's lenses and instruments was well known not only at the astronomical observatory but to the members of the Académie Royale des Sciences as well. When Fougeroux de Bondaroy was about to leave France for a voyage into Italy, he was officially commissioned by the Académie to visit Bologna to discover, if possible, Campani's methods for fashioning lenses, the secret of which was presumed to be hidden in his workshop equipment.

At Bologna de Bondaroy studied the optical equipment and conferred at length with Ercole Lelli. In the course of their discussions, Lelli told Bondaroy he planned to publish the results of his own studies of Campani's methods and his experiments with the equipment. However, Lelli's untimely death in 1766 occurred before his studies could be published. Although a careful search of

the libraries and archives of Bologna has been made by this writer, no trace of Lelli's notes on the Campani equipment has been found.

Upon his return to Paris, de Bondaroy prepared a comprehensive report of his examination of the Campani optical workshop equipment at Bologna. The report was read before the members of the Académie Royale des Sciences on 28 January 1764 and included in the *Mémoires* of the Académie for the same year, which were published in Amsterdam in 1768.

In his report, de Bondaroy stated that according to his observations several elements combined to create the perfection of Campani's lenses. The choice of the glass was important, the inventor's different and improved methods of cutting the lenses, together with the minute details of workmanship, all contributed to their success. De Bondaroy commented that it was believed at Bologna that Campani utilized Venetian glass for his object lenses. Although often filled with air bubbles, this glass appeared to be generally clearer and smoother, more durable and less streaked than the glass produced in France.

In the Campani collection at Bologna there were numerous metal moulds of all sizes, and de Bondaroy stated that it may have been in these that the secret of his success reposed, for it was generally believed that the inventor used many different moulds in the course of the production of a single lens, changing to moulds of increasing fineness progressively as he worked. During these operations, the piece of glass being converted into a lens was retained on a muller by means of a mastic. Amongst Campani's equipment there was found a mastic composed of black resin (colophony) and of turpentine of Venice.

The polish which was imparted to the object lens was the most difficult part of the work, for the more it was polished the more deformed it might become. It seemed probable that Campani did his polishing by hand and it did not appear that he had any advantage over later methods other than the fact that he was enabled to change moulds more easily. Inasmuch as he had a great number of moulds, it was possible with so many to select those which fitted most perfectly with the form the glass had taken in such a manner that if he were not satisfied with the mould selected, it could be changed again and again until the glass bore its entire surface on the mould or basin.

According to de Bondaroy, Campani attached his paper to the mould with a liquid gum which produced the least thickness and

inequality of surface. It was believed that Campani himself manufactured the paper he used for covering the moulds. At least it was certain that the paper was made expressly for this purpose, since a large stock of it was found in his workshop after his death.

De Bondaroy believed that Campani had no other means for working object lenses than those enumerated in the foregoing which differed little from the methods employed in the 18th century in France. This observation was based on what he had been told by Lelli. However, Campani did have a machine or lathe which he used for shaping the moulds. De Bondaroy had managed to obtain a drawing of the machine which someone had hidden for him at Bologna and which, since he had not been sworn to secrecy, he attached to his report to the Académie Royale (Fig. 2).[6] It was believed that Campani formed his moulds from brass or ductile copper. He cast them, moulded them, and then gave them the exact shape they were to have with the machine just mentioned.

The construction of basins for shaping object lenses was not unique with Campani, for others also employed them. In 1671, P. Cherubin d'Orleans illustrated and described a machine, having much in common with Campani's, in his work, *Dioptrique oculaire*. However, Campani's machine was undoubtedly of greater accuracy and perfection because it enabled the operator to adjust the length of the tool to the finest degree of accuracy. Various other writers have described machines which they used for forming moulds and which were reported to have great precision, but none of them was without some major drawback or inconvenience.

[6] According to the description of Fougeroux de Bondaroy, Campani's machine for fashioning lenses consisted of two large stones of parallelepiped shape about 3 feet in height set into a base 4 feet high. The stones had to be heavy to prevent jarring or other variation of the machine. Two copper mountings were firmly attached at the center of the stone B by large screws. These mountings were joined at the base to an adjustable plate. They bore a mandrel or chuck, also of copper, which terminated in a pulley and the basin or mould D. Two other mountings were fixed to the stone opposite with a wheel, E, the arbor which had a lever, and this wheel by means of a cord caused the pulley, the shaft and the basin or mould to turn. A support F is adjusted a short distance from the mould and is set the length of the channel G. To work the mould there is a bar or index IHL which is a strong piece of wood and more or less as long as the seat one wishes to give to the mould. This pointer has a steel tip, I, which was set into the end of the piece of wood. A support K is placed at about the center of the pointer to prevent folding or bending. When the pointer is long several supports are required so that it will not bend and change dimensions. This pointer is supported on the second of the two stones. The other end of the pointer than the one which works the mould is fastened to a piece of wood M, mobile within a dovetailed groove by a mounting N, and it is maintained solidly on the piece by means of a steel pin, Z. By means of this mobile piece it is easy to align the points C, D, and L, or to make the pointer move always parallel to the shaft which bears the mould. The piece N is likewise mobile and to it is fastened a dovetailed groove through which the wooden piece O passes. By means of this disposition, and aided by the mounting S and the screw P which traverses it, it is possible to make the necessary adjustments for working the moulds.

De Bondaroy summarized his report to the Académie Royale by stating that Campani owed the perfection of his lenses to the quality and perfection of his moulds, to the Venetian glass which he selected so carefully, to the Venetian tripoli which he used, to the paper utilized for polishing the lenses, and, finally, to the numerous little attentions he devoted to his work. But, de Bondaroy went on to ask, was there any certainty that the minute details of technique, which the celebrated master kept from the knowledge of others with such great care during his lifetime, were to be found in Campani's workshop which became the sole repository of his secrets after his death?

As an example, de Bondaroy reported that it was believed at Bologna that Campani went so far in his scrupulous attention to detail as to try to select days for finishing his lenses when the temperature was constant. However, he added, it was possible that an exaggerated opinion of Campani's knowledgeability might have been derived from the superiority of the object-lenses which he produced.

Campani produced many object-lenses. Being extremely jealous of his reputation, he discarded the poor ones and never allowed any but the very finest to appear. These he was then able to sell at a price sufficiently high to recompense him for the time and effort lost on the lenses he discarded.

Campani made object-lenses of very long focus. De Bondaroy saw one at the Institute at Bologna which had a focal length of 205 Roman palms (141 feet) which Louis XIV had desired to purchase. This lens had been broken. Knowing how much work would be required to duplicate it, Campani went to great effort to join the two parts of the broken lens and succeeded so well that it could be used as if it had never been broken.

The importance of de Bondaroy's report cannot be overemphasized, for it was only in this document that Campani's methods of worksmanship, as known and related by Lelli, have been recorded and preserved. Pope Benedict's *Chirografo* specified that the custodian of the optical workshop equipment, Ercole Lelli, was to be instructed in the use of each piece of the inventor's equipment by none other than Campani's daughter. It must be assumed that Lelli received this instruction, but his notes on the equipment, if any, cannot now be found. Since apparently Lelli devoted considerable time to the study and use of Campani's optical workshop

equipment, it is regrettable that he did not live to publish his observations.

Lelli's appointment was a most successful one, and for almost 20 years he dedicated himself to his duties with diligence and with consideration for the great responsibility which had been invested in him. Lelli died on 7 February 1766, at the age of 64. His death left an important gap among the members of the faculty of the Institute because it was difficult to find another gifted with his many and special abilities. More than two years passed before a replacement was selected by the Senate of Bologna. Finally, on 6 May 1768, the Senate appointed Giuseppe Bruni to be custodian of the Hall of Dioptrics, to serve in that capacity for a period of five years.

Bruni was a native of Ravenna who had moved to Bologna in 1748 as a young man. He established himself in the city as a mechanician and eventually married a young girl there. At the time of his appointment as custodian to replace Lelli, he had been employed as a mechanician in the Institute of the Sciences. He had leased space in the building for a small shop which he maintained while serving in his new capacity as custodian of the Hall of Anatomy and Hall of Dioptrics and Lathes. He continued in this manner for more than a year and a half, apparently fulfilling his several functions satisfactorily. By the end of that period, however, he was in real trouble.

According to a manuscript report of unknown authorship dated 1769, which is preserved in the Archives of State of Bologna, it was discovered that Bruni was guilty of a number of serious misdemeanors. The report began with the statement that the Assunteria, which presided over the Institute, reported to the illustrious auditor of the Torrone that Giuseppe Bruni had, some time previously, appropriated two telescopes from their place in the astronomical observatory, for Bruni, in addition to his other employments in the Institute, also worked in the observatory.

One of the stolen telescopes was a Newtonian instrument,[7] and the other was made "according to the invention of Dolon [*sic*]." Both of the instruments were finished with silver ornamentation.

[7] In the collections of the Biblioteca Universitaria of Bologna is an anonymous manuscript of circa 1671-1672 entitled "Descrittione d'un piccolo occhiale" (Description of a small telescope) which is filed as *MS 1496, II,* 2. The nine pages of Italian text of this document include a drawing of the famous Newtonian telescope. The caption heading the first page indicates that this is "A Description of a small telescope with which remote objects can be seen very distinctly as can be seen with larger telescopes, invented by Signor Newton, Professor of Mathematics in the University of Cambridge, and communicated to the author of this memorial." It is quite probable that the aforesaid "author of this memorial" was the one who constructed the Newtonian instrument which Bruni vandalized in the collection of the university observatory at Bologna.

The Newtonian telescope was eventually returned to its original repository, but it was later discovered that its various trappings, such as the ornamentation and the cartouche which bore the maker's name, all of which were of silver, had been removed and subsequently replaced with silverplated brass! It also came to light that Bruni had stripped and used the original silver decorations for making other works to his own advantage. The discovery was made by Giuseppe d'Anoᵉ. Paganucci, a youth who worked as an assistant mechanician in Bruni's own workshop at the Institute. The second missing telescope, of the Dollond type, was also subsequently restored to its repository as a result of the insistence of the professors of the observatory.

A further dereliction which came to their attention was the fact that Bruni had remove the leads from the windows of the observatory. An accounting of the missing leading was demanded. But in a catalogue or inventory which Bruni presented to the Assunteria, listing all the work projects he had executed for the Institute, no accounting had been given of the aforesaid leading. According to the inventory, the cost of the work which Bruni had completed to that date totalled 337.18 zecchini (before 1835 one zecchino was equivalent to $2.28).

It was furthermore suspected by the Assunteria that some of the moulds or patterns which Campani had used for making telescopic lenses were missing from the collection in the Hall of Dioptrics, and it was believed that these had been sold by Bruni and shipped out of the city of Bologna. It was also reported that the brass ornaments of one of Campani's turning lathes of red wood was missing, and that they had been hidden by Bruni in a shop in the city. A search was to be made for the missing fittings.

It was ordered by the Assunteria that further evidence of misdemeanor be brought immediately to the attention of the auditor. Meanwhile the Assunteria went on to request that criminal proceedings be initiated against Bruni, inasmuch as that governing body wished to take every precaution for the preservation of the Campani workshop equipment, which it considered to be part of Bologna's most precious patrimony.

The next record relating to Bruni's defection was dated two weeks later, 15 January 1770, and was presumably a directive issued to the Assunteria by the auditor of the Torrone. This was in the form of a formal notice to the members of the Assunteria meeting in congress at the Institute that inasmuch as Giuseppe Bruni, cus-

FIG. 1. The University and the Institute of the Sciences in Bologna. (From Gaetano Lenzi's *Descrizione dell'Istituto delle Scienze di Bologna*, 1841.

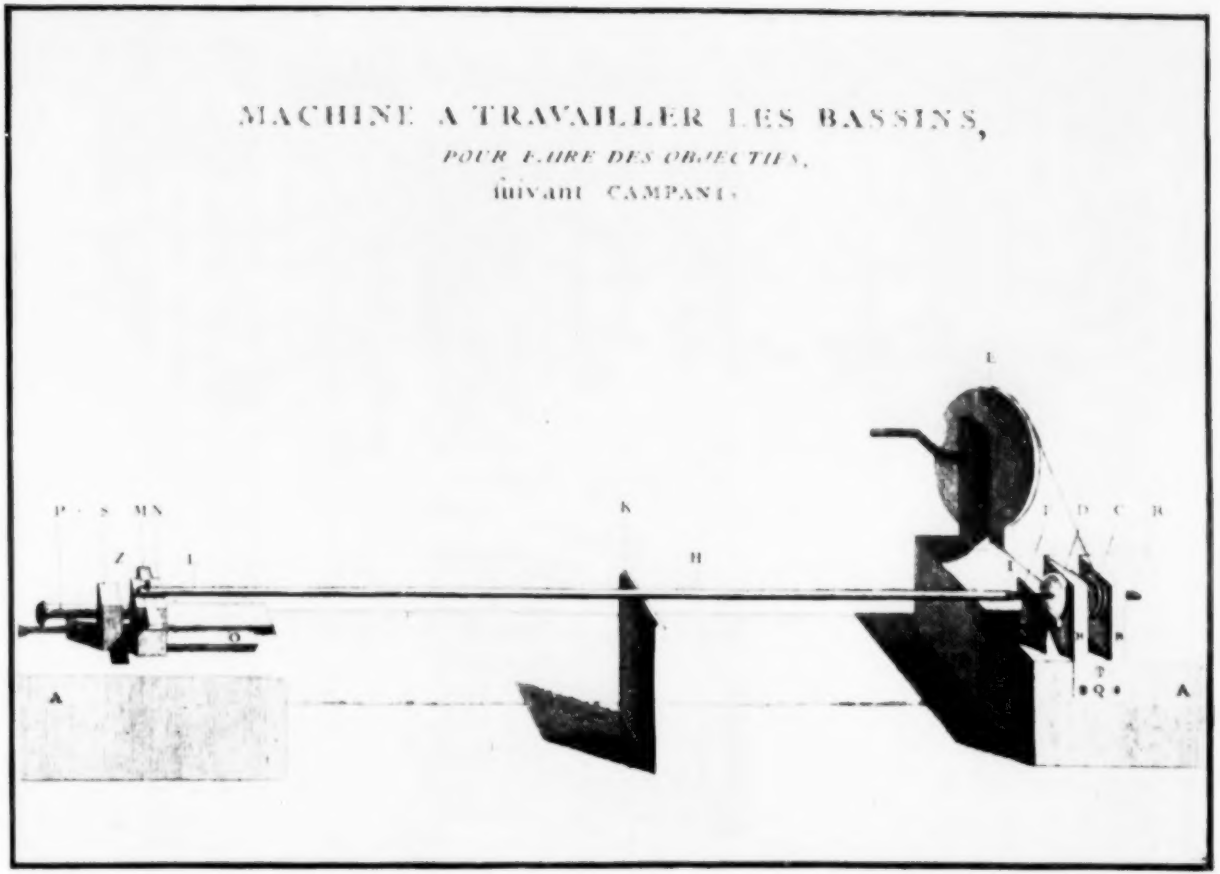

FIG. 2. Campani's lathe for turning the moulds used in fashioning object-lenses, reconstructed from de Bondaroy's description. (From *Mémoires de l'Académie Royale des Sciences pour l'Année 1764, Plate 6.*)

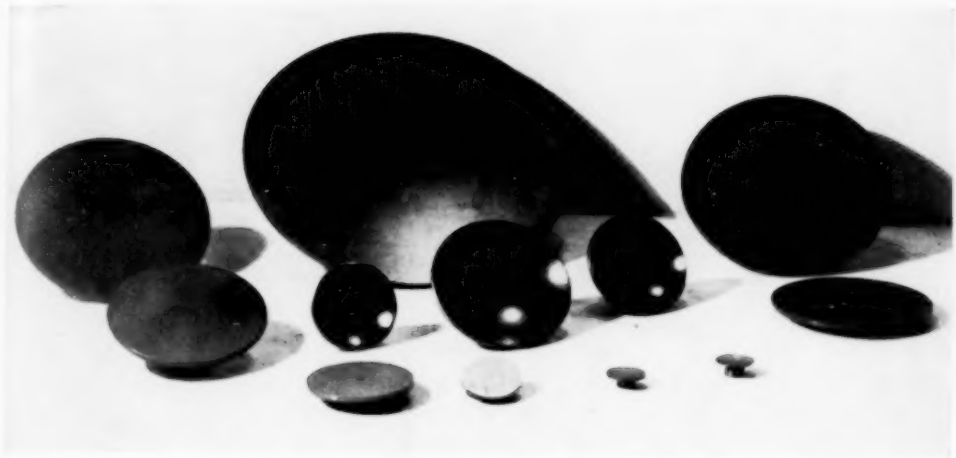

FIG. 3a. Series of 12 assorted moulds for fashioning lenses from the Campani optical workshop equipment.

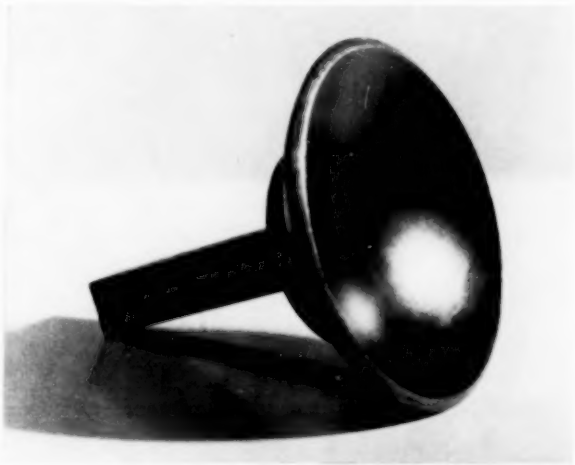

FIG. 3b. A bronze mould for convex lenses.

FIG. 3c. A bronze mould, flat.

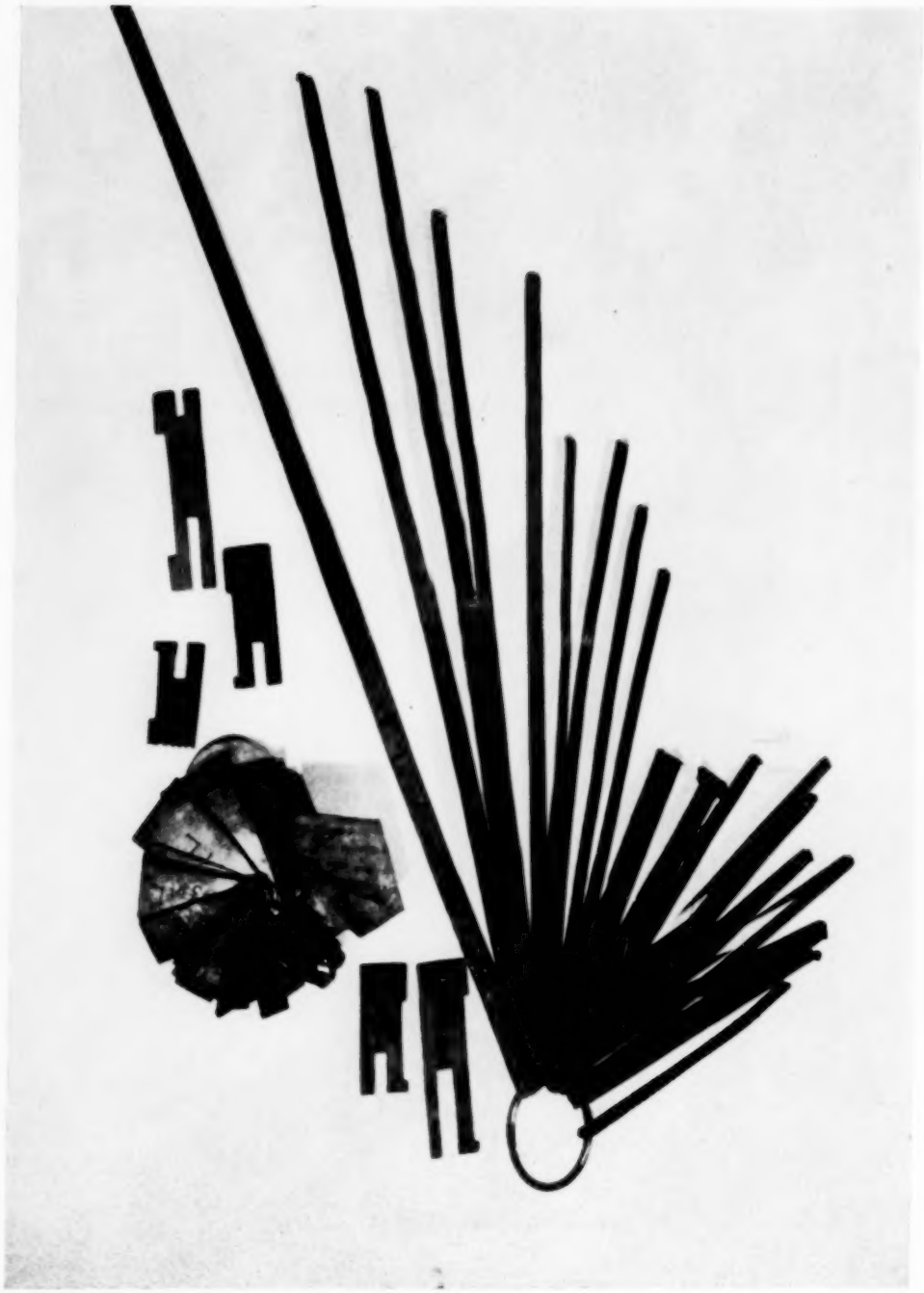

FIG. 4. Two bundles of modules or patterns.

todian of the Hall of Dioptrics, had committed various defections which had been brought to the notice of the Assunteria under whose jurisdiction he was employed, it became their responsibility to make certain that Bruni repaired whatever damage he had caused and that every precaution be taken to prevent further damage.

The Curia Criminale of Bologna was ordered to proceed to apprehend Bruni and collect the evidence necessary in order to obtain his confession, in accordance with the acts and processes formed at the first Scabello of the tribunal of the Torrone. In the instructions of the Conventions established in 1715 by General Marsigli, and confirmed by the apostolic act of Pope Clement XI, it was specified that "It will always be the liberty or privilege of the Senate to remove from the Institute whichever Subject has become unworthy." In a desire to follow the wishes of the public in the present situation, the Assunteria placed the matter of Bruni's dismissal to a vote. Meanwhile Bruni had been apprehended and imprisoned and a judgment obtained against him after he had confessed his crime.

It was at this point in the proceedings that a mystery developed. Even before a vote was taken, it appeared to be a foregone conclusion that Bruni would be restored to his position and allowed to continue his employment. The record of the meeting of the Assunteria reported that

> Without going into a discussion of the past relating to said Bruni, the Assunteria does not wish to assert itself other than to beg the distinguished gentlemen [of the tribunal of the Torrone] that their vote shall order that the aforesaid Bruni continue in his employment. However, if further defection by Bruni becomes apparent, it will then be within the jurisdiction of the Assunteria to dismiss him immediately from his office without further recourse.

However, the members of the Assunteria were requested to declare their opinions in the matter in order to obtain a plurality of votes. If the vote were affirmative, Bruni was to continue as custodian of the Hall of Dioptrics with the express provision that if he should commit new defections, the Assunteria would have full authority without recourse to the Senate to dismiss him immediately and permanently. If the vote were negative, it meant that Bruni would be dismissed at once.

As had been already anticipated, the Assunteria voted to permit Bruni to resume his duties as custodian of the Hall of Dioptrics, in spite of the fact that he had made a formal confession of his thefts.

It seems incredible today that the public would permit such rank judicial negligence and that political pressure could be exerted to such a degree. It was apparent that Bruni enjoyed influential political connections, for nothing else would explain such gross miscarriage of justice. This was probably made possible by political conditions which existed in Bologna as a result of the dual authority by which the city was governed. For centuries the Bolognese Reggimento and the Papal court at Rome had battled for the maintenance and revindication of ancient prerogatives of sovereignty. The identity of Bruni's friend or sponsor at court cannot be determined, inasmuch as the files relating to his criminal judgment are not available to the public. Whoever his friends may have been, there is no doubt that they were extremely influential.

Within the two weeks following the voting, the Assunteria tried to pick up the pieces of the incident and bring order once more to the Institute of the Sciences. A document dated 27 January 1770 listed the items which Bruni had removed from the Institute premises and eventually restored, consigning them to Giacomo Conti who was designated as custodian of the properties of the Institute. According to the list, the following items were recovered from Bruni and preserved in the Institute storehouse by Conti:

182 Round irons from the wickets of the great windows of the observatory;
61 other round irons of the lunettes of the aforesaid observatory windows;
15 chains with inscriptions or labels (i.e., *Cattenezzi con cartella*);
7 window catches (*Marlette*);
1 *Fellaro* (grid?) of iron which was at one of the windows over the cupola of the observatory. . . .[8]

Other items recovered from Bruni as a result of the judgment were sold to tradesmen by order of the Assunteria and payment credited to that body. These items included:

51 *oncie* (12 oncia are equivalent to 0.7984 lbs.,) of broken glass sold to the furnace ..... Z. 2-2-6

66 *oncie* of lead melted into two forms estimated at 51 *oncie* and 15 *oncie,* sold to Signor Zarrini, glazier, at a rate of 16 *zecchini* per hundredweight ..... Z. 10-12-6

7 *oncie* of bent sheet brass at a rate of 12 *soldi,* sold to Signor Silvetti, brazier, according to his estimate, for the amount of ..... Z. 4-4-0

Making a total remuneration of Zecchini 16-19-0.

[8] Several of the words which appear on this document cannot be found in the various Italian-English dictionaries which have been consulted. These words are *Cattenezzi, Marlette* and *Fellaro.* It is possible that the forms used are colloquialisms limited to Bologna or certain sections of Italy, and the translations offered here are based on that premise.

This tally was supplemented by a list of the stolen items which were still missing and had not been recovered and which included:

1. "The original silver ornamentation of the Newtonian telescope, including the ornamental hinges, the band, the name-plate with the name of the maker." It was noted that the telescope was made of wood and that the replaced ornaments were of silverplated brass;

2. The moulds or plates (*piatti*) of the Campani collection which had been sold by Bruni and taken out of the city of Bologna;

3. The brass fittings of Campani's lathe of red wood. The brass had been melted down in a shop in Bologna;

4. "The leadings of the windows of the observatory, which had been employed for actual use [i.e., which had been put to legitimate use], but for which remuneration had not been made to the Institute." The statement indicated that Bruni had stripped and reused the lead from the windows with the knowledge and assent of the Assunteria, but that he had neglected to make remuneration for it;

5. "The telescope of Dolon [i.e., Dollond] which had silver decorations and had been kept in the observatory";

6. "There is some suspicion that the rod of gold is missing in a machine for measuring the dilation of heat, a [machine] which was donated, it is believed, by Monsieur Leprotti";

7. "The lathes of Campani have suffered considerably because they have been used around iron."

Bruni was released from imprisonment and apparently returned directly to his duties at the Institute, where he resumed his work quietly and continued without further defection for the next several years.

The final chapter in Bruni's career was written early in 1779. At a joint meeting of the Institute and the Boards of the Munitions and Militia which took place at the Palace on 30 January 1779, the petition of Giuseppe Bruni was read in which he requested a coadjutor or assistant for his office as mechanician in the Hall of Physics.

One of the members present, Senator Lambertini, added that Bruni would have no difficulty in requesting a pension and the additional favor of being allowed to continue working at the Institute. It was unanimously voted to award the pension to Bruni, at the same time allowing him to continue to conduct his own shop on the premises of the Institute. However, it was discovered that if Bruni's own shop remained in its present location, it would be detrimental to the Institute's building. Accordingly, two members of the board, Aldrovandi and Savioli, were delegated to find another suitable location to which Bruni's shop could be moved, with the agreement meanwhile that he be pensioned.

At a subsequent meeting of the Institute on 25 February, Senators Aldrovandi and Savioli reported on their mission. They suggested that Bruni's shop should be removed from its present apartment and that he should return at the first opportunity to his lodgings, which had an entrance under the portico of the Institute. Then part of the house next door would be made available to him, inasmuch as that was at present partially destroyed by the courtyard of the Stamperia (i.e., printing office). It was suggested that Bruni establish his forge in the shop under the portico, with which he could have communication or passage from within without detriment to the anvils.

As a conclusion to his ten years of service as the custodian of the Hall of Optics and latterly of the Hall of Physics, Bruni was accorded a pension by the Institute and provided with suitable space for the continuation of his own mechanic's shop, where he did business privately, exclusive of his connections with the Institute.

And what of the Campani optical workshop equipment? It seems that with the passage of time, assisted by the ravages of Bruni, the contents of the collection were slowly reduced, item by item, until almost nothing remains at the present.

A description of the collection in 1780 is found in a little book entitled *Notizie dell 'Origine e Progressi dell' Istituto delle Scienze di Bologna e Sue Accademie* which appeared under the auspices of the Institute the year following Bruni's retirement. This little work stated that

> Climbing the last two landings of the grand staircase and turning to the right, we find collected in one room all the tools of the celebrated deceased Giuseppe Campani for use in optics and dioptrics, which Pope Benedict XIV had acquired from the former's heirs, and had had constructed entirely at his own expense the cabinets in which they were conserved; these consisted of a series of plate moulds of metal duplicated for the construction of whatever length of telescope from 200 Roman palms to all of the shorter measures. Furthermore, there were reposing in a cabinet thirteen object-lenses, of all focal lengths; among others was one of 216 palms, which was the one with which the famous Cassini had discovered the satellites of Saturn.
>
> There were also two machines, which served for the construction of plate moulds of every portion of a sphere of which there could be need; one was the noted machine of the said Campana (*sic*) and the other had been found and executed by Giuseppe Bruni, the present optical worker and custodian of the said Hall of the Institute.
>
> In other rooms can be seen all of the lathes which served that department, and also all of the others which were brought from Germany by General Marsigli.

According to this account, Bruni had not as yet terminated his appointment in 1780, possibly because his pension was to become effective at the end of the year in which it was voted.[9]

Of particular note was the reference to the lathe or machine "which had been found and executed by Giuseppe Bruni." It seems unlikely, in view of his history, that Bruni would have devised or invented a new machine for fashioning lenses. It was much more probable that the machine was an adaptation that Bruni had constructed from one of the Campani lathes, perhaps the one from which he had removed the brass fittings!

The application of a new study program in 1803 had grave consequences for the Institute, for its primary function thereupon passed to the newly organized Università Nazionale which undertook the teaching of experimental science with a modern science faculty, and for this purpose annexed the Institute's library and archeological and scientific collections. The redisposition of the scientific collections inevitably resulted in more harm to the optical workshop equipment of Campani. A number of pieces were undoubtedly lost or misplaced, for only a handful of the items from the once extensive collection have survived as identifiable. These are now preserved at the Istituto di Fisica 'A. Righi' of the University of Bologna. The most important of the surviving items are six object-lenses described as follows:

1. Object-lens on cardboard frame, marred, 223 mm. (which is equivalent to 1 Palm), with a marginal spacer of about 5 mm. bound around the edge with fine cardboard laced in red by a spacer of about 1 mm. Inscribed on the glass just inside the edge *"Giuseppe Campani in Roma Palmi 194"* (which corresponds to 43.3 m.).

2. Object-lens, the glass of which has a diameter of 209.3 mm. with a marginal spacer of 4.3 mm. Lacking the original border, of which traces remain; on the span of this the glass shows two scratches of triangular form on the face opposite to that on which the inscription appears and which reads *"Giuseppe Campani in Roma Palmi 138"* (which is equivalent to 30.8 m.). The margin of the glass is inscribed in the same hand with the number *"138"* indicating that it was to be covered by the frame.

3. Object-lens measuring 208 mm. including the frame with a spacer of about 4 mm. with the original frame inscribed *"Giuseppi Campani in Roma Palmi 142."* A more recent inscription on the red border is the number *"35.7 m."*

4. Another object-lens on cardboard measuring 198 mm. including the frame with a spacer of about 4 mm. with the original border slightly damaged. An opening in the center of the lens has a diameter of 23 mm., with two scratches near the opening on the opposite face. A marginal

[9] Bruni had been appointed to his position in 1768 for a period of five years but retained his post for more than 12.

crack spreads from the border about 12 mm. The lens is inscribed on the edge *"Giuseppe Campani in Roma Palmi 120"* (i.e., 26.8 mm.).

5. Object-lens with a diameter of 197 mm. including the frame, and a spacer of about 4 mm. with the original border incised in the glass *"Giuseppe Campani in Roma Palmi 140"* (equivalent to 31.3 mm.).

6. Object-lens of 137.5 mm. in diameter, corresponding to about 3/5 Palms. There is a spacer of 4.5 mm., with traces of the original border on the larger space of which may be observed small scratches. The focal length of this lens appears to be less than that of other Campani lenses in the collection; it is inscribed *"Giuseppe Campani in Roma"* without designation of focal length.

In addition to the six lenses, the surviving items include seven large moulds of bronze as well as five smaller flat plate moulds for the fashioning of lenses (Fig. 3). Also preserved are two bundles of modules or patterns cut from thin sheet brass, each stamped or marked in ink with specifications and identification of its particular purpose (Fig. 4). One marked *"P 50,"* for instance, served as a contour pattern for a lens of a focal length of 50 Palms. Others served as measures for the telescope sections, for diameters and lengths of the tubes, and were marked with the measurements of each.

Unfortunately, no trace can be found at the present time of another item which formed part of the original collection, namely, "the manuscript book of G. C. of the proportions which are required for the objectives with relation to the oculars" (*Un Libretto Manuscritto di Giuseppe Campana delle proporzioni, che devano avere gli oggettivi agl'oculari).*

In the *Catalogo con Aggiornamenti* published for the Istituto e Museo di Storia delle Scienze in Florence in 1952 in commemoration of the first national exposition of the History of Science (May to October 1929), the list of surviving Campani items at Bologna included also *"due tavole per il calcolo delle lenti,"* which has been translated as "two tables or reference schedules for the calculation of lenses." An exhaustive search of the collections of the astronomical observatory, the library, and the Istituto di Fisica 'A. Righi' of the University of Bologna has failed to bring these items to light. The word *tavole* may also be interpreted to mean "tablets" in the sense of thin boards with measurements.

But what has become of the numerous other items which survived the depredations of Giuseppe Bruni? It is probable that some of these may still exist in Bologna, scattered throughout the various collections in the University and other museums in the city without identification as part of the Campani collection. It would be a most

worthwhile enterprise to make a search for the surviving remnants of the optical workshop equipment and bring it together once again.

It is ironic after Campani's own reticence and the precautions which Pope Benedict prescribed at the time of the equipment's donation that it should have been mismanaged so wantonly within such a short space of time. As an additional safeguard for the preservation of this precious patrimony, the Senate of Bologna rendered the restrictions even more rigorous by requiring that in order to borrow any of its items, it was necessary to obtain the authorization of the Assunteria, where the keys to the cabinets were kept.

There was not, nor is there now, in existence a collection of equal significance in the history of the development of the optical sciences.

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The Rebel Physiologist—Bennet Dowler*

KARLEM RIESS**

BENNET Dowler was one of the leading figures in science in the deep South in the period immediately preceding the Civil War. He was born in 1797, in what is now West Virginia, and received his early education in Virginia and Pennsylvania. He was graduated from the University of Maryland with the degree of doctor of medicine in 1827 and began his medical career in routine rural practice in West Virginia. For reasons unknown, he moved to New Orleans, Louisiana in 1836, remaining there until his death in 1878.

His chief investigations included a study of the human body immediately after death, with regard to contractility, capillary circulation and calorification; a study of animal heat in health, disease, and after death; and neurological experiments based on the comparative physiology of the alligator. His first paper was printed in the *Wheeling Gazette* and reprinted in the *Transylvania Journal of Medicine* in 1833. His total output, so far as is known, exceeded 284 papers, reviews, and criticisms, comprising over 2,719 printed pages.

Dowler served as the editor of the *New Orleans Medical and Surgical Journal* from 1854 to 1861. Prior to that time he had been a steady contributor to its pages. His management of the *Journal* was not popular, for there was strong criticism of the amount of space devoted to his own research, his reviews, and his choice of material.

Early in his life Dowler adopted a pompous, cumbersome style of writing. His papers are filled with brief citations, usually without adequate documentation, from sources of all types. References from philosophy, literature, and history accompany those from anatomy and physiology. Dowler was widely read and had access to all current medical books and periodicals; there was little chance that any important development in his field was overlooked. This did not mean Dowler's immediate acceptance of new ideas, for, as we shall see, he prolonged several controversies for many years.

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On the personal side we find that Dowler was a very egotistical, irritable individual, inclined to be unhappy when he could not dominate the scene. He had a flair for showmanship, as his public dissections indicate. He encouraged a good argument in oral or written debate but never admitted that he was wrong.

He was one of the founders of the New Orleans Academy of Sciences and of the Louisiana State Medical Society. He served as chairman of the Committee on Medical Science of the American Medical Association (1851) and held corresponding membership in the Academy of Natural Sciences of Philadelphia; was a fellow and honorary vice-president of the Medico-Chirurgical Society of Philadelphia; a fellow of the Medical Society of Virginia; a founder and fellow of the Medical Society of Kentucky; a corresponding member of the Society of Statistical Medicine of New York; a fellow of the Society of Northern Antiquarians of Copenhagen, and a member of the Royal Medical Society of Copenhagen.

Dowler's investigations of the human body immediately after death were probably his most extensive. These comprised contractility studies, measurements of animal heat (post-mortem calorification), and experiments on capillary circulation. In one of his early papers he outlined the basis of his research:

> Death, in the common acceptation, may, and often does, take place hours before the body dies in a physiological sense. Volition, thought, sensation, respiration and the heart's action have ceased, and for all the purposes of existence, life is no more, but it does not hence follow that all the vital actions are extinct; both animal and organic life may exist in many cases.[1]

In a later summary of his work, we read:

> With one exception he has found in the course of his experiments no fact invalidating the fundamental laws which he announced in his first publications relative to post mortem contractility of the muscular system. He had prematurely assumed, early in his researches, in accordance with the prevailing theory, that the death rigidity, or rigor mortis, is antagonistic to, or incompatible with, the coexistence of muscular contraction; but he soon found instances which led him to maintain that the contractile function exists in all bodies immediately after death, although in some it is scarcely appreciable, while in others it is absent or feeble at first, but gradually increases. . . . He was consequently led to the conclusion that this force is inherent in the muscular tissue and in every portion of it, being wholly independent of the brain, spinal cord and nerves.[10]

A typical description of his observations may be of interest:

> . . . . . muscular contractions, after death, are more common in yellow fever subjects than in any other class of fever victims . . . a slight scratch with the back of the knife across the course of the muscular fibres, in any part of

the body, causes the muscles to contract, and to swell into firm ridges exactly at the line of mechanical irritation . . . observe the arm as it lies extended upon the table, supple and relaxed—we strike it with a horn, a cane or metallic rod, a conductor or nonconductor of electricity, either on the skin or on the naked muscle—contraction takes place instantly, sometimes slowly . . . for example, we strike the biceps muscle, about its middle—the arm is bent, the hand, perhaps strikes a violent slap against the face, or rises more slowly with a uniform motion pointing to the zenith, and then gradually falls back from the perpendicular to the horizontal position.[1]

He continues with examples of blows, reactions to blows, irritants and the like, producing contractions after death.

In his post-mortem researches Dowler believed in a semi-statistical approach, obtaining vast quantities of data to support his theories. As he wrote in the same paper, he recognized the limitations of numerical results without interpretation of correlated symptoms. Almost every one of his papers contains case after case, with symptoms and behavior before death as well as post-mortem findings.

Numerical aggregations, numerical analyses, numerical averages, promise results, which, though less certain than mathematics, less poetical than speculation, will, with every succeeding generation, approach nearer to perfection. The amount of labor by this method, for a single individual, would be absolutely appalling to the most ardent imagination; . . . the numeric method is something better than the easy method, conjecture. . . . Number, as an element in working out results, is a safe guide, only so far as its facts are accurate, pertinent and essential. In morbid anatomy, which is, in connexion with symptoms, the foundation of correct treatment, these are all important, otherwise we must fall into errors the most fatal under the imposing array of statistics and medical mathematics. Aggregations may be true, and yet of no value.[1]

In another set of post-mortem experiments Dowler studied the color of the internal organs. He cited the vast differences in descriptions which were published and stressed that prompt dissection would always reveal the same, true color and appearance of the organs.

Dowler was particularly pleased by the response of the citizens of New Orleans toward post-mortem dissections. He stated that there were no prejudices, as were found in other localities. The facilities at Charity Hospital were excellent, with the "Dead House . . . in a noiseless and unfrequented spot and consequently favorable for post mortem investigations."[1] The yellow fever and cholera epidemics furnished hundreds of cadavers for Dowler's experiments. He noted that very rarely did members of a family or

friends claim a body from Charity Hospital, so that all types, ages, and races were available for his research. His dissections, including the writing of his notes and preparation of special organs, took about four hours.

Dowler's first interest in capillary circulation was recorded in 1841: "The capillary circulation in yellow fever, and other acute fevers, probably survives respiration and the heart's action; when it ceases, cadaveric hyperaemia takes place."* This brief notation was the beginning of an extensive investigation. He was able to show in hundreds of cases that capillary circulation was active for measurable periods following cessation of respiration and heart action, and even in cases of removal of the heart.

In his principal paper on this subject Dowler attacked Harvey's discovery of the circulation of the blood as not fully explaining the mechanism for circulation in the capillaries or in the venous system. He disagreed with the chemical theory of Draper, with the Matteuci hypotheses, and with Marshall Hall's interpretations. He was able to demonstrate "conclusively" that the capillary system was under the control of the left ventricle of the heart and used the physical theories of hydrodynamics, of capillarity, and of friction to substantiate these claims. In his analysis of blood globules he employed the principles of optics to justify his claim that blood globules were probably simple constituents of the blood in spherical form.

Dowler's studies in animal heat (post-mortem calorification) were carried out on hundreds of human subjects, during and after the epidemics of cholera and yellow fever, and he spent about twenty years collecting data in this field. In his experiments he used a Réaumur thermometer, keeping records of his own body temperature as well as data on atmospheric pressure, temperature, weather conditions, and the like. He was convinced that the thermometer was a more reliable indicator of death than the stethoscope. The post-mortem rise in temperature, to a degree always much higher than previously attained, was referred to in many of his papers.

The experiments began twenty-five minutes after death, and continued one hour and thirty minutes, the history of which fills ten pages; from these the following extracts are taken: A thermometer remained in the armpit 55 minutes; the first five minutes gave 105°; five minutes, 106½°; five min-

* Dowler notes, Folio X, 13 Nov. 1841.

utes, 108°; ten minutes, 108°; ten minutes, 108°; ten minutes, 108°; ten minutes, 108¼°; pelvic region, seven minutes, 111°; five minutes, 111°; five minutes, 110°; stomach, 109¾°; chest, 107°, etc. Great distention of the veins. A ligature was placed on the arm, a vein opened, about two ounces of blood jetted out, after which a trickling took place for a considerable time, amounting, by estimation, to twelve ounces. The circulation was found to be very rapid about the head; (the patient had died suddenly with apoplectic symptoms); the skin of the face and neck was injected, dark, livid and somewhat mottled, there was no cadaveric hyperaemia or injection of the dependent parts; the external jugular veins were distended as if ready to burst. . . . The left jugular was opened, as for ordinary bloodletting, but no bandage or pressure was used, the head being raised, so that the orifice was nearly on a level with the breast bone. The blood jetted completely, without wetting the skin, forming an arch, the diameter of which, continued to extend for five minutes; at the end of eight minutes the arch had contracted, owing, apparently, to small clots on the margins of the orifice, and the skin having once become wet, the blood, without being materially diminished, ran down the neck, jetting occasionally on removing clots from the orifice. For about one hour the flow was copious, but, at the end of that time, was diminishing rapidly. I caught nearly three pounds at first, but as much of it did not jet out but ran down the neck, I could only estimate the amount (which I did) at five pounds, or eighty ounces from the jugular alone. As the blood letting progressed, the congestion and discoloration of the skin of the face diminished. . . .[7]

At that time the belief in most medical circles was that animal heat was due to respiration. Dowler was convinced that this was completely erroneous and backed up his claim with many experiments.

The heat of the patient in the early stage of yellow fever is usually very great, but it falls off toward the close of the disease, in both the convalescent and dying stages; but, among the dead, in many cases, it rises higher than in life, from a quarter of an hour to six or seven hours after death, rising (sometimes to 113°) and falling in the very same and in different regions both internally and externally. The laws of this heat do not fall under those belonging to physiological, morbid, physical or chemical caloric, as now recognized in these sciences; they constitute, therefore, a separate branch of thermotics entirely new. This heat, after death, is not peculiar to yellow fever subjects. . . .[7]

Some of Dowler's most spectacular experiments were his vivisections of the alligator. Published results appeared as early as March 1845, but there were probably some before this date. It was Dowler's policy to invite a small audience of physicians and friends to witness his vivisections or dissections, so that his findings could be substantiated. Many prominent physicians, politicians, and friends were frequent guests. On some occasions Dowler had one of the guests serve as secretary and record the proceedings, which

were later published. A few illustrations of the vivisections will prove of interest:

1. In an animal whose spinal cord was severed in the cervical and thoracic regions:

> . . . this animal displayed complete intelligence, volition and voluntary motions in all divisions of the body. It saw, heard, felt, defended itself, showed anger, fear and even friendly attention to its keeper, a black boy. This latter manifestation is so extraordinary in an alligator that I will notice it first. . . .[4]

2. In an animal decapitated:

> . . . saw its enemies, opened its mouth to bite, at the proper time, and nictated when a foreign body approached the eye. The pupils responded naturally to light. (The headless trunk) manifested in a still higher degree sensation, intelligence, definite, well-directed muscular actions. . . . There was not a single unmeaning or convulsive action.[4]

> The head jumped from the dissecting table and it alighted on the floor six to eight feet distant from its original position. The headless trunk . . . exhibited such phenomena as are usually attributed to the brain, namely sensation, volition and intelligential motion. . . . It trembled, receded, rolled over, curved, placed its limbs accurately on the exact spot (to remove an irritant) . . . it always used the limb best adapted to the purpose.[4]

3. The body of an animal was divided into three sections, with the spine and cord divided. The sections were connected only by skin and muscle. All three parts displayed

> both sensation, volition and accurately adapted muscular motion. The eyes winked or nictated. The head, toward the close of the experiments, attempted to bite Dr. Reynolds [an observer]. The lumbar and caudal divisions gave the most unequivocal indications of pain, contrivance and adaptive action.[6]

His interest in the alligator was designed to secure proof in support of his "diffused sensorium" theory of the nervous system, as opposed to centralization as advocated by Sir Charles Bell, Marshall Hall, Magendie, and others. He was not completely satisfied with vivisection, but it did furnish the information he desired.

> The method of determining function by vivi-section is bad; yet where can a better be found? The biologist is reduced to the sad alternative of remaining in a great degree ignorant, if he rejects all methods not directly demonstrative. He reads in an artificial condition, a natural condition; in a part, the whole; in analysis, synthesis; in decomposed forces, compound forces; in vital maelstroms, cataracts and crevasses, the smooth, noiseless, equable and ever-flowing river of life; in concentrated agony, the concentration of animal happiness, that is the laws, perfect health; in an incom-

plete death, he takes his lesson upon the complete science of life. . . . Like the tempest-tossed Columbus in search of the new world, he finds here and there, drifting fragments from the mysterious realm.[4]

Dowler's paper in the *New York Journal of Medicine* (1846) on post-mortem contractility of the muscles contained a few sharp observations on the reflex theory. He objected to Haller's experiments because they were made not on man but on inferior animals. Yet Dowler never did use warm-blooded animals in his experiments. He also published a politely phrased, direct condemnation of Marshall Hall's *Memoirs on the nervous system*. He proclaimed: "I will at once admit that the reflex doctrine is ingenious and has been useful in exciting inquiry, though its claims as a fundamental principle of science are, as I expect to show, altogether visionary."[2] His work on alligators is part of this attempt to refute the then current theories. He established, to his own satisfaction, in the case of the human body that

". . . post mortem contractility in the human cadaver, has no connection with or dependence upon, the spinal marrow. This may be received as an axiom, though directly opposed to the reflex theory, and is easily proved by amputating the shoulder in the proper manner."[2]

"The theoretical bias to centralization which prevails in modern physiology is not warranted either by experiments, nor the transcendental philosophy. Why should not the sensorium be diffused, instead of being restricted to a single centre, or mere point in the cranial, spinal or abdominal cavity? Why should all the lines of intellection, sensation, motion and vitality meet in, or radiate from, one of three centres?"[4]

The appearance of a classification of nerves by Professor R. Dunglison of the University of Virginia irritated Dowler and gave him another target for a verbal blast. Dunglison grouped the nerves into four classes: sensory, motor, excitor, and motor of the spinal marrow. Dowler wrote:

This is a fair enumeration of the existing doctrines of those so called "distinguished physiologists" yet this enumeration is entirely hypothetical. In what code of morality do "distinguished physiologists" get a warrant to assert, as physical or anatomical facts, that which no one has ever seen—no one has ever demonstrated? . . . If, for instance, there be two distinct sets of nerves for the excito-motory function of the spinal cord, wholly independent of the brain, why not show them to the sceptical? Is there no difference between a name and a thing? . . . The only anatomical proof yet offered is this—namely—the nerves have double roots; and hence, it is said, must have double offices![5]

He continued his attacks on centralization:

A greater error in physiology never prevailed than that now almost universally recognized as a fundamental truth, namely, that the whole of man, his entire Ens is but a bundle of conducting nerves, or rather a minute unknown sensorial spot or centre. If teleology, or the doctrine of final causes, as explained by exquisite organization, by unmistakable adaptation, by the harmonious union of means and ends, and by physiological anatomy, be regarded, then the muscular may, in at least several respects, claim precedence over the nervous system.[6]

A summary of Dowler's own position in the controversy concerning the nervous system, i.e., his doctrine of the "diffused sensorium" is as follows:

. . . that the functions and structures of the nervous system constitute a unity altogether inconsistent with the anatomical assumption of four distinct and separate sets of nerves, and a corresponding fourfold set of functions; that there is no anatomical or other proof that one set of nerves transmits impressions to, and a separate set from, a sensorial spot somewhere in the brain, nor that the nerves themselves are simple conductors and wholly insensible; that the two separate sets of nerves usually assigned to what is called the excito-motory action of the spinal cord are wholly hypothetical; that instead of four traveling impressions there is but one, the primary or sensiferous impression, which is simultaneously cognized upon the periphery as well as the centre, and not solely by an unknown spot in the brain through the intermedium of a secondarily transmitted impression, being intuitively felt where it really is; and that the sensuous cognition or sensation is immediate, intuitive and not representative, nor the result of transmitted secondary impressions, but a directly felt relation, ab initio, between an object and a sentient subject, and not one between a more secondary representation, idea or transmitted impression of an object.[10]

Dowler repeatedly challenged his critics to interpret his alligator vivisections on the basis of the "prevalent theory." He had observed correctly the experimental phenomena, the behavior of the animals, but had not considered the possibility that his "diffused sensorium" theory was wrong. He was actually observing coordinated or compound reflexes but did not realize this. Most of his critics acknowledged his opposition but did not reply with the strong language Dowler used in the majority of his papers. For example, an unknown writer in the *British and Foreign Medico-Chirurgical Review,* as quoted in the *Boston Medical and Surgical Journal,* stated: "Dr. Dowler has made himself conspicuous among his brethren by his refusal to receive certain of those neurological doctrines which, under one form or another, are now generally admitted amongst well informed physiologists."[9] But Dowler's faith in his ideas and experiments remained. There is no record of his acceptance of the theories of the "distinguished physiologists,"

merely a broadening of his interests on acceptance of the editorship of the *New Orleans Medical and Surgical Journal.*

Another crusade which was more successful was Dowler's sponsorship of public health measures and quarantine for disease. He wrote many articles condemning the sanitary conditions of New Orleans and the area, urging proper health measures and laws for quarantine. After the 1853 epidemic of yellow fever the advocates of these measures, including Dowler, were completely successful.

In his many published papers we find such a variety of titles as sunstroke, obstetrics, vital dynamics of city government, meteorology, natural history of death, medicolegal jurisprudence, viviparous fishes of Louisiana, vermifuges, "Historical retrospections of the fundamental principles and polity of the American Medical Association," Oriental medicine, chemical therapeutics and novelties, medico-legal remarks on punishment, cancer, vital statistics among Negroes, embalming and burial, pathological anatomy of the large intestine, "critical and speculative researches on the fundamental principles of subjective science in connection with medical and experimental investigations, with remarks on the present state of medicine," contributions to the hydrographical thermology and hygiene of the Mississippi River, natural history of the *Amphiumidae,* and many other topics. There is no record of publication, because of hostilities, between 1861 and 1866. One article appeared in 1867, and to the best of my knowledge, none thereafter.

Dowler's contributions to science in the deep South were significant. He was most successful in creating an interest in, and attitude favorable to, scientific investigation. Many of his experiments were sound and the facts accurately reported. However, his persistence in his own theories, regardless of their validity, lessened his importance as an international physiologist. He may be regarded as a genuinely sincere investigator, establishing many facts for the first time by his methods. An unknown contemporary summed up the current opinion of Dowler at the height of his career:

> The contributions of Dr. Dowler to physiological as well as to the collateral sciences, have elicited high commendation from the medical press through our almost boundless country. His bold and original views, his slashing criticisms, his great learning and his inductive powers of reasoning, at once challenge our admiration and extort the highest encomiums from the pen of the critic.[8]

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The Early History of Choriocarcinoma

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IT is an odd circumstance that a tumor which is so distinctive both clinically and pathologically as choriocarcinoma was not segregated as an entity until 1889, its histogenesis not established until 1895 nor fully accepted until 1903. Review of the earlier relevant literature reveals some reasons for this late recognition and its analysis sheds light on the process by which new ideas in science gain or fail of acceptance. The important problems in oncology today are sufficiently similar to those of two generations ago that we can profit from a study of the controversies of that time.

The important years are 1889, when Max Sänger[44] suggested that there was a special form of malignant tumor derived from the decidua of pregnancy which he called *sarcoma uteri deciduocellulare*, 1895 when Felix Marchand[31] demonstrated that these tumors were invariably the sequel to normal pregnancy, abortion, hydatidiform mole, or ectopic pregnancy, and that they are derived from chorionic epithelium, and 1903 when John H. Teacher[52] was able to convince his clinical colleagues of the validity of Marchand's inferences. We shall first consider some of the early, historic examples of chorionic tumors, then give a résumé of the Sänger-Marchand controversy, and finally recapitulate the difficulties encountered when Marchand's ideas were introduced into England in 1896 and their ultimate triumph in 1903.

I. Early Examples of Chorionic Tumors

It is scarcely surprising that a lesion so remarkable as a hydatidiform mole should have been known to the ancients; Hippocrates and his pupil Diocles of Carystos recognized it as a cause of abortion, and Aetius of Amida in the 6th century A.D. first used the term "hydatid." While we have little information about the lesion in medieval times, it was well known during the Renaissance. Smalbraak[49] has given a delightful account of the accouchement of Margaret, Countess of Henneberg, on Good Friday in the year 1276 when she was delivered of 365 "children." Recently, Richardson and Hertig[43] have furnished an account of the first hydatidiform mole to be described in New England (1638), possibly the first recorded instance in the Western Hemisphere. However, accord-

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ing to Thoms,[53] it remained for a Parisian midwife, Marie Anne Victoire Boivin (1773-1841), to be the first to state clearly that a hydatidiform mole was of chorionic origin. In her *Nouvelles Récherches de la Mole Vésiculaire,* etc. (Paris, 1827) she states that "this vascular growth depends upon a disease of the serous membranes covering the ovum."

Surprisingly, the recognition of neoplasm derived from the chorion was late. Surely, despite their rarity, the gross features of a chorioadenoma destruens or a choriocarcinoma, the familiar hemorrhagic tumors invariably associated with pregnancy, would be considered sufficiently distinct from the usual uterine tumors to make recognition easy even before the development of histological methods. Marchand[31] assigns the first report of choriocarcinoma to de Gregorini[13] who cited in 1795 a case observed by Philipp Friedrich Meckel.* This concerned a woman of unstated age who, following a "pregnancy" of 10 months, delivered a large hydatidiform mole which contained an amniotic cavity with a well-formed fetus of about 2½ months' gestational age. After a year she developed symptoms ascribed to pulmonary phthisis and expired after thoracenteses removed sanguineous fluid. The autopsy is reported to have revealed general cachexia, scrofulous mesenteric lymph nodes, sero-sanguineous ascites, and a fungating, hemorrhagic mass arising from the uterine corpus adherent to the omentum. The lungs are described as showing the cavities and consolidations consistent with pulmonary tuberculosis. We are reluctant to accept this case as adequately documented; there are too many aspects which must be explained away, especially the 2½-month fetus and the presence of tuberculosis. In an era when tuberculosis was one of the most common causes of death, it seems unlikely that so astute an observer as Meckel could have confused the nodular, hemorrhagic masses of metastatic choriocarcinoma with the greyish caseated cavities of tuberculosis, nor does the mention of scrofulous mesenteric nodes reinforce the idea of metastasis from the uterine tumor, but rather dissemination of the tuberculous process in the well-known form of *tabes mesenterica.* As to the nature of the hemorrhagic tumor which penetrated all layers of the uterine wall, *deponent sayeth not.*

The first unequivocal report of a chorionic tumor is the account in 1840 by William Wilton,[58] Surgeon to the Brighton Lying-in Institution, of a 37-year-old gravida 6, para 4, aborta 1, who devel-

* This case is mentioned briefly in Meckel's contribution to C. A. Baudelocque's *Anleitung zur Entbindungskunst,* vol. 1, Leipzig, 1791.

oped uterine hemorrhage and bearing-down pain nine weeks following what was thought to be an incomplete abortion. A mass arising from the uterus developed in the left iliac region. Despite treatment with blue pill, leeches, and cataplasmata, as well as wine of antimony and opiates, her condition worsened. Her pain became progressively more severe, and uterine bleeding continued. She developed signs and symptoms of internal hemorrhage and "brandy and water was administered, which enabled her to expel large volumes of flatus, in the act of doing which she expired," 14 weeks after the incomplete abortion. At post-mortem examination,

> Two large coagula . . . lay immediately over the intestines. . . . On reflecting the viscera inwards, a considerable quantity of fluid blood, about three quarts, was found. . . . In the center of the superior outlet of the pelvis towards the left side was a large, rounded tumour, through the superior and posterior portion of which a coagulum protruded from an opening in the peritoneal covering about a quarter of an inch in diameter. The coagulum being removed, . . . a small cluster of hydatids escaped. . . . The uterus being removed, there was observed . . . immediately below the peritoneum, a highly varicose state of the veins giving to it a mottled and raised appearance, much thinner at some parts than at others. In this diseased part . . . was the opening already referred to. . . . The uterus being opened, . . . a considerable mass of hydatids protruded into the cavity of the viscus, a large quantity of which was easily detached; but a cluster, equal in size to a small tea-cup, was firmly adherent to the fundus. . . [where] the lining membrane was completely wanting, and they [the hydatids] were imbedded in the structure of the uterus, the vessels being dissected into layers by them.

Although there is no microscopic description, this is indisputably an example of what we would call today a chorioadenoma destruens (or mola destruens) which penetrated the uterine wall and produced death by intraperitoneal hemorrhage. No metastases were described; the growth was confined to the uterus. Wilton's methodical clinical and pathological observations as well as his lucid style merit wider recognition. The next example of a chorionic tumor to be reported as such was Volkmann's account[55] in 1867 of a lesion described and illustrated (Fig. 1) as an interstitial destructive mole. From the gross appearance it is more in the nature of a diffusely invasive mole than the usual chorioadenoma destruens, although the distinction between the two terms is often artificial. However, there was no conspicuous degree of trophoblastic proliferation on microscopic examination. In 1876 Maier[28] described two examples of uterine tumors with the structure of decidual tissue; it is not clear from either the anamnestic or the morphological details what the true nature of these tumors might

have been. However, he coined the term "deciduoma" to apply to them.

Probably the first true examples of choriocarcinoma were reported in 1877 by Hans Chiari,[5] then an assistant in pathology at Vienna where he later became full professor. These cases were originally regarded as unusual examples of primary carcinoma of the uterus in young women associated with a recent pregnancy. The first case (Fig. 2) was in a woman who died six months after a normal full term delivery with uncontrollable uterine bleeding and signs of pulmonary consolidations. Autopsy disclosed the primary tumor covering the entire uterine mucosa, satellite nodules in the myometrium, extension to the broad ligament, and hemorrhagic pulmonary metastases. The second case was essentially similar; the third case developed following an abortion at the end of six months. Although he recognized them as epithelial tumors (not sarcomas) and was impressed by their association with recent pregnancy, he did not at that time recognize their origin from trophoblast; nevertheless, he stated that these tumors developed in the uterine wall in precisely those areas which had participated in the formation of the placenta and decidua. We recognize these cases as trophoblastic tumors because they were subsequently reported as examples of "deciduoma malignum" by Pfeifer[42] with the addition of a fourth case. This later report appeared in 1890, after Sänger had first enunciated his doctrine of decidual origin of such tumors. Apparently, at that time Chiari concurred with Sänger's theory and permitted Pfeifer to republish his original cases in conformity with that view. Following the promulgation of Marchand's theory, Chiari once again changed his mind and considered them to have arisen from trophoblast and to be examples of choriocarcinoma.*

Between the time of Chiari's report and Sänger's first statement on the "deciduoma" theory, three isolated reports[18,14,35] of unusual uterine tumors appeared which merit passing notice. Metastatic vaginal nodules were described by Jacubasch; however, histological details are meagre. Guttenplan's case is the first recorded example of a choriocarcinoma developing after a hydatidiform mole. Meyer's case probably represents a superficially invasive mole. Klebs[23] in his textbook cites the cases of Wilton and Volkmann as well as that of Meyer, classifying the lesions as papillomas and recognizing their origin from chorionic epithelium. However,

* See Teacher,[32] p. 14.

this refers to invasive moles and chorioadenomata destruentia, not to choriocarcinomas.

II. The Sänger-Marchand Controversy (1889-1895)

The next step forward was made by Max Sänger (1853-1903). His first contribution to our understanding of chorionic tumors appeared on 16 July 1888 as a brief account[44] of two unusual cases of abortion. The first of these occurred at eight weeks of gestation and was followed by uterine hemorrhages. Curetting produced "fungous-spongy tissue" composed of round cells with large nuclei, small spindle cells, and areas of hemorrhage. Cough and dyspnea developed, and the patient went downhill, dying seven months after the onset of symptoms. Autopsy disclosed a large purplish-red spongy uterine tumor which had the appearance of a "sarcoma telangiectoides." There were several satellite nodules in the uterine wall, and metastases were present. In addition to the cell populations described in the curettings, there were also present "multinucleated cells similar to and recalling the as yet undescribed malignant metastasizing deciduoma." Sänger described these cells as nonepithelial; ergo, the neoplasm was classified as a sarcoma. In addition, the clearly hematogenous nature of the metastases was taken to confirm this idea. The second case in Sänger's short communication is an example of a rather protracted case of retained, missed abortion. There is no substantial documentation to this brief account; Sänger did not publish the expanded version of his theory until 1893, when in a detailed account[45] he described and illustrated his first case at length and reviewed the literature, much of which had appeared since his original presentation. In fact, so influential was Sänger's opinion that between 1889 and 1893, no less than 12 cases of "deciduoma malignum" were reported by nine different authors.

In the 1893 article Sänger classified deciduoma as follows:

I. Decidual sarcoma with participation of chorionic elements.
  A. Diffuse, ulcerated type [cf. Chiari's case 1[5] and Schmorl's case 1[47]] involving the decidual coats.
  B. Nodular, non-ulcerated type [cf. Sänger's case[45]] with involvement of the myometrium.
  C. Mixed nodular-ulcerative type [cf. Chiari's cases 2 and 3[5] and Pfeifer[42]].
II. Decidual sarcoma with participation of chorionic elements.
  A. Following a hydatidiform mole [cf. Müller[37], Kaltenbach[20], and Guttenplan[14]].
III. Interstitial, destructive hydatidiform mole [cf. Volkmann[55]] and destructive placental polyps [cf. Zahn[59]].

This classification embraces every variety of chorionic neoplasm that we recognize today. The essential difference is the belief that these tumors are sarcomas and arise from decidua. It is noteworthy that in the 1893 classification Sänger took into account the observations of Gottschalk[11,12] who in 1892 regarded the multinucleated cells of the "deciduoma" as being derived from trophoblast. This observation was to prove important in Marchand's theory as well. It represents an attempt on Sänger's part to reconcile all known observations into one theory. Unfortunately, Sänger went astray. He classified the tumor in question as a sarcoma because of its gross appearance and its route of spread; it followed then that the tumor must have arisen from decidua, the only tissue in the vicinity which could give rise to a tumor in which a prominent element was polyhedral cells with distinct cell interfaces and a centrally placed nucleus. Unfortunately, the point at issue was one of histogenesis which is decided not by where a tumor goes to but whence it comes.

It is of interest to examine some of the 12 cases which appeared in the literature between Sänger's first and second articles. All of the nine observers, except Gottschalk, fell into the same error as Sänger. For example, Pestalozza reported two cases[41] of choriocarcinoma following abortion; a month later he reported separately[41a] a case of choriocarcinoma following a vesicular mole. Though he held the solution in his hand, he failed to recognize the common histopathological denominator in the three cases. Even so distinguished a pathologist as Schmorl[47] failed to recognize the dual nature of the cellular elements comprising the neoplasm. In fact, the histological description is too brief to permit evaluation of his cases.

The best documented case of this group was reported by Gottschalk,[11,12] and the inferences he drew vary from Sänger's ideas. Gottschalk's initial report was presented on 16 November 1892, antedating the publication of Sänger's second article in January 1893[45] by about two months. However, there is internal evidence in Sänger's publication that he was familiar with Gottschalk's case and interpretations. In Gottschalk's case the tumor developed following an abortion. Curettage yielded tissue suggestive of placental origin. When bleeding persisted, hysterectomy was performed and revealed that "a new growth had developed at the placental site." The patient died seven months later with multiple pulmonary metastases and metastases in the right kidney and spleen. Gottschalk commented that

> In this case we see the villi transformed into a true malignant neoplasm which not only grow through the decidua but also, wherever they come into contact with decidual cells, vaccinate them with sarcomatous poison so that the decidual cells undergo atypical proliferation and are incorporated into the malignant neoplasm. The malignant cells of such villi act as an immediate stimulus to the decidual cells, that is: We are dealing here with the *implantation of a fetal tumor into maternal tissues*, leading to a local destruction of the uterine wall.

In other words, Gottschalk believed that both placental and decidual elements were neoplastic, but that the initial neoplastic change was in the chorionic villi and that the neoplastic change in decidua was an induction phenomenon. He indicated his belief that the neoplastic transformation occurring in chorionic villi took place in the stromal cells and drew an analogy with the stromal changes in a hydatidiform mole (myxoma chorii). On this basis, the tumor in question was interpreted as a sarcoma containing both chorionic and decidual elements, hence Sänger's term *"sarcoma deciduocellulare unter Beteiligung chorialer Elemente."*

Gottschalk's insistence on the dominant participation of chorionic elements set the stage for the development of Marchand's theories. These were first presented to the medical public at a meeting of the Medical Society of Marburg on 4 July 1894,[30] and were published in full the following year.[31] At the time of this contribution Felix Marchand (1846-1928) was professor of pathology at Marburg, having occupied the chair since 1883. His doctoral thesis in 1870 dealt with "Developmental History as the only Basis for Comparative Anatomy," and he had achieved considerable reputation for his sequential studies on wound healing. In 1900 he was elected professor of pathology at Leipzig where he completed an illustrious career.

Marchand's observations were confined to two cases, neither with typical clinical backgrounds, and a review of 26 previously reported instances of "so-called decidual tumors" from the literature. His first case was also independently reported by his clinical confrère, Ahlfeld,[1] as a decidual sarcoma. The case was that of a 17-year-old girl who had a ruptured ectopic pregnancy. She was well for an interval of two months, then developed sudden abdominal pain and profuse vaginal bleeding. On examination a mass was felt in the cul de sac and two vaginal tumor nodules were seen, one ulcerated, the other with a smooth violaceous surface. Biopsy of one of the vaginal tumors revealed tissue similar in appearance to that described as sarcoma of chorionic villi by Gottschalk.[12] A few

days later the vaginal nodules were partly excised and their bases curetted. Following this, the patient ran a septic course developing a few pyemic abscesses. The mass behind the uterus increased in size and there was a tumorous infiltration anteriorly above the symphysis pubis. Signs of peritonitis developed, and the patient expired as an attempt to drain the peritoneal cavity was made. Autopsy disclosed the tumor to be primary in the left fallopian tube. Apart from the vaginal metastases noted clinically, there were no other metastatic deposits, though multiple pulmonary thromboses were present. The fact that neoplasm in this case was primary in the tube, the least common site for gestational choriocarcinoma, impelled Marchand to study the tissue. His detailed analysis of the development of the implantation site in the tube led to the conclusion that the neoplasm he was studying was composed of trophoblastic elements which infiltrated maternal tissue and invaded blood vessels in precisely the same fashion as other ectopically implanted pregnancies.

This conclusion was reinforced by his observations of a second case of choriocarcinoma which was sent to him by Everke, a gynecologist in Bochum. This neoplasm occurred in a 34-year-old gravida 9 who developed profuse vaginal bleeding one month after her last delivery. Despite treatment, hemorrhage persisted over a period of four months. Passage of a sound revealed the fundus uteri to be perforated by a large tumor mass, and vaginal hysterectomy was performed. Examination of the surgical specimen revealed a tumor that was histologically identical with that of the first case. A tumor thrombus was found in veins of the broad ligament. The patient survived, and follow-up examination one year later revealed no evidence of disease. This represents the first successful surgical removal of a choriocarcinoma.

Marchand described and illustrated the fact that the tumors were composed of two cellular elements, one of large plasmodial masses of multinucleated cells (syncytiotrophoblast), the other of small polyhedral cells with sharply defined cell membranes (cytotrophoblast), the two being intermingled, and both showing the cellular features of malignant neoplasia (Fig. 3). He recognized the cellular elements as epithelial in nature and considered the tumor to be an epithelioma, later[32] coining the term chorionepithelioma to describe it.* However, at the time of this communica-

* In this paper we use the term choriocarcinoma synonymously with chorionepithelioma, the former being more common in contemporary usage.

tion he was uncertain whether both epithelial layers of the chorionic villi were fetal and expressed this uncertainty in a subsequent essay:[33]

> A difficulty presented itself in forming an opinion upon the origin of the tissue forms present in this growth, viz., the very diverse opinions which existed upon the two layers of the chorionic epithelium, . . . While several embryologists held both layers to be foetal, others having in view the conditions found in animals referred the outer layer to a maternal, the inner layer to a foetal source. Inasmuch as at that time I had not had the opportunity to decide this question by personal study of the early human ova, I had to assent to one of these views, and I felt obliged to decide upon the latter, . . . I regard as of the greatest importance the observation that the malignant growth actually arises from the entire epithelial covering of the villi. . . .

Thus, even as he traced the histogenesis of the tumor, Marchand, as a morbid anatomist, was at the mercy of unsettled questions in normal embryological microscopic anatomy.

Marchand soon attempted to settle the unresolved question of fetal vs. maternal origin of syncytiotrophoblast and during the next few years compared the implantation of the human ovum with that of the rabbit. His observations led him to conclude by 1898 that in the human both layers of trophoblast were of fetal origin. He also took issue with the classical view of Virchow that the primary defect in hydatidiform moles was the myxomatous degeneration of the chorionic villi and was among the early investigators to emphasize the role of epithelial proliferation in determining the sequelae to hydatidiform moles. By the time he published his third and fourth cases in 1898,[32] Marchand was certain of his results and altered the nomenclature from *"sogenannte deciduale Geschwülste"* to chorionepithelioma. His contribution rests upon the careful application of the methods of morbid anatomy to tissue and the demonstration of transitions from normal to abnormal structure. His observations are detailed and complete, and his inferences sound.

Marchand was not satisfied merely with morphological proof of the histogenesis. His first major contribution revealed how gestational choriocarcinoma develops. The 26 cases from the literature plus his own two he classified as the sequelae of a normally implanted pregnancy (8 cases), abortion (6 cases), tubal pregnancy (1 case), and hydatidiform mole (13 cases)—a distribution surprisingly similar to that obtained in more recent studies of larger series of cases. Even though re-evaluation of these 28 cases does not fully support Marchand's diagnosis of choriocarcinoma in all of

them (e.g. the case reported by von Kahlden[19] may well be an example of death from blood loss and sepsis following retention of a destructive polyp, and the case reported by Löhlein[27] sounds suspiciously like a chorioadenoma destruens), this does not alter the historical importance of his tabulation and analysis.

III. THE ACCEPTANCE OF MARCHAND'S THEORY (1895-1903)

Continental observers had little hesitation in accepting Marchand's ideas of 1894-95[30,31] regarding the histogenesis of choriocarcinoma and its association with one or another of the forms of pregnancy. An important link was supplied in 1896 by Apfelstadt and Aschoff[2] who described a chorionic malignancy developing after a hydatidiform mole, metastasizing to the vagina, lungs, and spleen, in which both the primary uterine tumor and the vaginal metastases contained molar villi surrounded by proliferated, presumably neoplastic trophoblast. Were it not for the pulmonary and splenic metastases, the mere presence of villi in the vagina might be dismissed as retrograde venous embolization of molar villi in a chorioadenoma destruens. However, the presence of pulmonary and splenic metastases implies that this may have been one of the rare examples of a chorioadenoma destruens which developed into a choriocarcinoma.

By 1898 Marchand[32] was able to list more than 40 articles describing over 50 cases of chorionic neoplasm. The majority of these were from Germany and Austria, but reports were appearing in France, Holland, Sweden, Italy, Russia, and the United States, all of which agreed essentially with his point of view. It is in this publication that he emphasized the origin of both layers of trophoblastic epithelium from fetal rather than maternal tissue, citing some of the evidence gained from examination of early human and rabbit ova. He also added two new cases to the literature, both of which developed following a hydatidiform mole. The illustration of the tumor in this second case is the most striking Marchand ever published (Fig. 4). It is in this article that he designates the lesion by the term chorionepithelioma.

Later in 1898 Aschoff[3] published a critical review of the problem on choriocarcinoma accepting Marchand's views *in toto*. The only reservations entertained by continental observers at this time were by Chiari and Sänger, both of whom felt that although the cases described by Marchand were truly derived from trophoblast, this did not imply that there were no malignant tumors derived

from decidua.* Veit[54] also believed the tumor to be a sarcoma, possibly as a result of his studies on deportation of trophoblast. By the time of Münzer's review[39] in 1902, not even this view was seriously entertained. It was also about this time that the presence of trophoblastic elements was first being recognized in teratomas, notably those of the testis. Schlagenhaufer[46] went so far as to describe fetal membranes and chorionic villi in one such case, developing the theory that they were derived from "included" ova, but this notion was rapidly discounted by others. However, this particular error indicates how firmly Marchand's concept of trophoblast-arising-from-villi had taken hold of the faculties of microscopic hermeneutics.

Two of the cases reported in the American literature are of particular interest. In 1895 Bacon[4] reported as an example of deciduoma malignum a case which he studied in Chiari's laboratory. Although Bacon subtitled his report "a contribution to the study of malignant tumors composed of placental tissue," he concluded that the lesion was "composed of decidual cells which penetrate the uterine wall . . . and which penetrate vascular walls, thus causing hemorrhages and leading to the formation of metastases." This coincides with the view expressed by Pfeifer[42] writing five years previously from Chiari's laboratory. However, Bacon goes on to say that "certain uterine tumors, forming another group, resemble these in clinical history, but are composed of more or less changed chorionic villi that grow in venous sinuses and form metastatic growths similar to those seen in the uterus."

As a result of the general acceptance of Marchand's views, Bacon's publication was without significant impact in the United States. More influential was the case report by J. Whitridge Williams.[56] This is the first indigenous American case report of choriocarcinoma. It occurred in a 35-year-old Negress who died two months after term delivery of a dead infant. The postpartum course was complicated by the appearance of a nodule on the right labium majus which increased in size, became gangrenous and ulcerated, ultimately leading to a recto-vaginal fistula and death from septicemia. Autopsy disclosed the primary tumor in the corpus uteri and metastases in the liver and lungs. Williams unhesitatingly followed the line of thought represented by Meyer,[35] Klebs,[23] Gottschalk,[11,12] Fränkel,[10] and Marchand[32] that the "syncytium . . . is either derived from or very closely connected with

* See Teacher,[52] p. 14.

what is generally termed chorionic epithelium." Like Marchand, he considered contemporary embryological evidence and concluded that these syncytia were maternal in origin, ascribing correctly the cytotrophoblastic elements to a fetal origin. He stated that the tumor was not composed of decidual cells and agreed with Marchand that Gottschalk had failed to demonstrate that the tumor was sarcomatous. However, Williams had the opportunity to examine sections from Menge's case[34] and concurred with that observer that the tumor was composed of both neoplastic syncytial cells and neoplastic decidual cells. Although Williams' article appeared before the second part of Marchand's communication in which there is a tabulation of "acceptable cases" of *sogenannte "deciduale" Geschwülste,* he lists, as suitably documented examples, 22 of the 28 cases cited by Marchand. Marchand and Williams agree in eliminating at least six cases accepted as deciduoma malignum by other authors. It is apparent that Williams' reasoning and conclusions were as close to Marchand's as one can expect, and it is fortunate that this communication set the tone for subsequent investigations of this tumor in the United States.

The only significant exception to the general acceptance of Marchand's theory was in England. It is instructive to pursue in some detail the ratiocination by which Marchand's theory was first rejected by the Obstetrical Society of London in 1896, then reevaluated, and finally accepted in 1903. The Society was accustomed to meet on Wednesdays in its handsome Georgian edifice in Hanover Square. The *Transactions* of the Society were preserved in conscientious detail, and we may therefore follow the controversy step by step.

The first recorded discussion of choriocarcinoma was at a meeting of the Obstetrical Society of London on 1 April 1896 when John Malcolm,[29] Surgeon to the Samaritan Free Hospital of Edinburgh, presented an account of a woman who died three months after an abortion "of malignant disease of the uterus with numerous deposits in the lungs." Microscopic examination revealed the primary tumor to consist of "collections of sarcoma cells . . . most being large with a single nucleus . . . [and] not a few large irregularly-shaped masses of protoplasm with several or many nuclei." This was followed by a report by J. Rutherford Morison,[36] Assistant Surgeon to the Newcastle-on-Tyne Royal Infirmary, of a case of "deciduoma malignum" which developed following term delivery. The diagnosis was based on a hysterectomy specimen, but no micro-

scopic description is given, and autopsy permission could not be obtained. Then followed the report by Herbert Spencer,[48] professor of obstetric medicine in University College, London, of a case of "deciduoma malignum" dating back to 1889. The patient died nine weeks following term delivery. Autopsy disclosed a primary uterine tumor resembling the specimen in Chiari's first case (see Fig. 2) and numerous metastatic nodules in the lungs. On microscopic examination both syncytial cells and individual cells were recognized. Spencer considered the growth to be a sarcoma and avoided discussion as to whether the growth originated in the decidua or in the chorionic villi, saying that "Before the pathogeny of the disease can be thoroughly known, microscopic investigations will need to be made of the unseparated, adherent, hydatidiform and ectopic placenta, and of the placental polypus." Though avoiding controversy, Spencer fell into the same error as Sänger. However, his assertion that microscopic study of the placental site was the key to the problem was certainly well justified.

After the presentation of the three cases, T. Watts Eden[9] rose to discuss the problem of deciduoma malignum. This was a prepared critique, not merely extemporaneous remarks. Eden (1864-1946), later to become one of England's leading obstetricians, the coauthor of Eden and Lockyer's classic textbooks on obstetrics and gynecology,* was at that time on the staff of both Chelsea Hospital for Women and Queen Charlotte's Hospital, and was just beginning his career. The previous year he had presented his preliminary observations on the development and normal structure of the human placenta[7] to the Society. His discussion summarized the reports by Sänger, Gottschalk, Marchand, and Williams. He reiterated his view[8] that the syncytium was the fetal epiblast, and that the cytotrophoblast was a specialized layer of the villous stroma. However, he admitted that the question was not settled and pointed out that neither Marchand nor Williams had demonstrated the transition from placental villi to the cellular structures composing the tumors, an important missing link. He did not feel that the fetal origin of the tumors in question had been established adequately and concluded by setting forth two criteria which should be fulfilled before such a theory could be supported, "(i) the connection of the growth with a preceding gestation; (ii) its development from structures which may be definitely recognized as placental relics."

* Eden, T. W. and Lockyer, C. *Practical obstetrics*, 1915, and *The new system of gynaecology*, 1917.

In an addendum to his critical summary, Eden acknowledged with thanks the receipt of sections of secondary growths from a case of sarcoma of the testis sent him by Dr. Kanthack. In these sections there were numerous cellular elements identical with the syncytia of deciduoma malignum. As a result of this case Eden concluded that the syncytial theory for the origin of the tumors in question was unnecessary, and that the majority of cases of so-called deciduoma malignum were to be regarded as rapidly growing uterine sarcomas.

Further discussion on deciduoma malignum was adjourned to the meeting of 6 May.[40] This was opened by Alfredo Antunes Kanthack (1863-1898) who at this time was head of the newly formed department of pathology at St. Bartholomew's Hospital and who became professor of pathology at Cambridge University the following year. He committed himself without reservation to the theory that these tumors were sarcomas, explaining the multinucleated cell by saying that "similar plasmodial masses, formed by cell fusion, occurred in many rapidly growing sarcomas, and that it was not legitimate to argue from morphological analogy that . . . [they] were derived from syncytium." He stated that Spencer[48] did not recognize this *reductio ad absurdum*, yet correctly classified his case as a sarcoma, but that Williams,[56] who had correctly recognized the *reductio*, had argued a sarcoma into a carcinoma. He felt that there was no proof that pregnancy, abortion, or retention of chorionic villi had anything to do with the cause of malignant growth.

The discussion was continued by John Clarence Webster (1863-1950), originator of the operation for uterine suspension known as the Baldy-Webster technique, later professor of obstetrics and gynecology at Rush Medical College. He was chiefly concerned with establishing the view based on his own embryological investigations that the syncytiotrophoblast was fetal in origin rather than maternal and had little to say about the tumors themselves, but concluded his remarks by stating that "If . . . the syncytium formed in . . . these malignant growths is the same as that of pregnancy, . . . it must be admitted that, whatever be the origin of the other cells . . . the syncytial part is due to the malignant development of foetal epiblast parasitic on the uterine mucosa. . . ."

The next speaker was William E. Fothergill (1865-1926), one of the important contributors to the development of the Man-

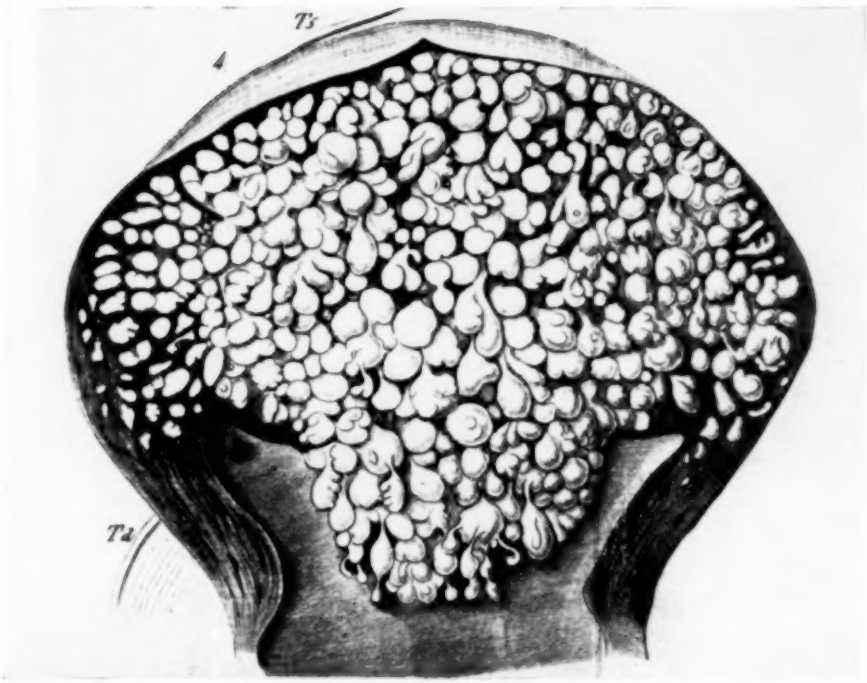

FIG. 1. Reproduction of Volkmann's[55] illustration of an invasive destructive mole.

FIG. 2. Reproduction of Chiari's[5] illustration of a primary uterine carcinoma later re-evaluated as a choriocarcinoma.

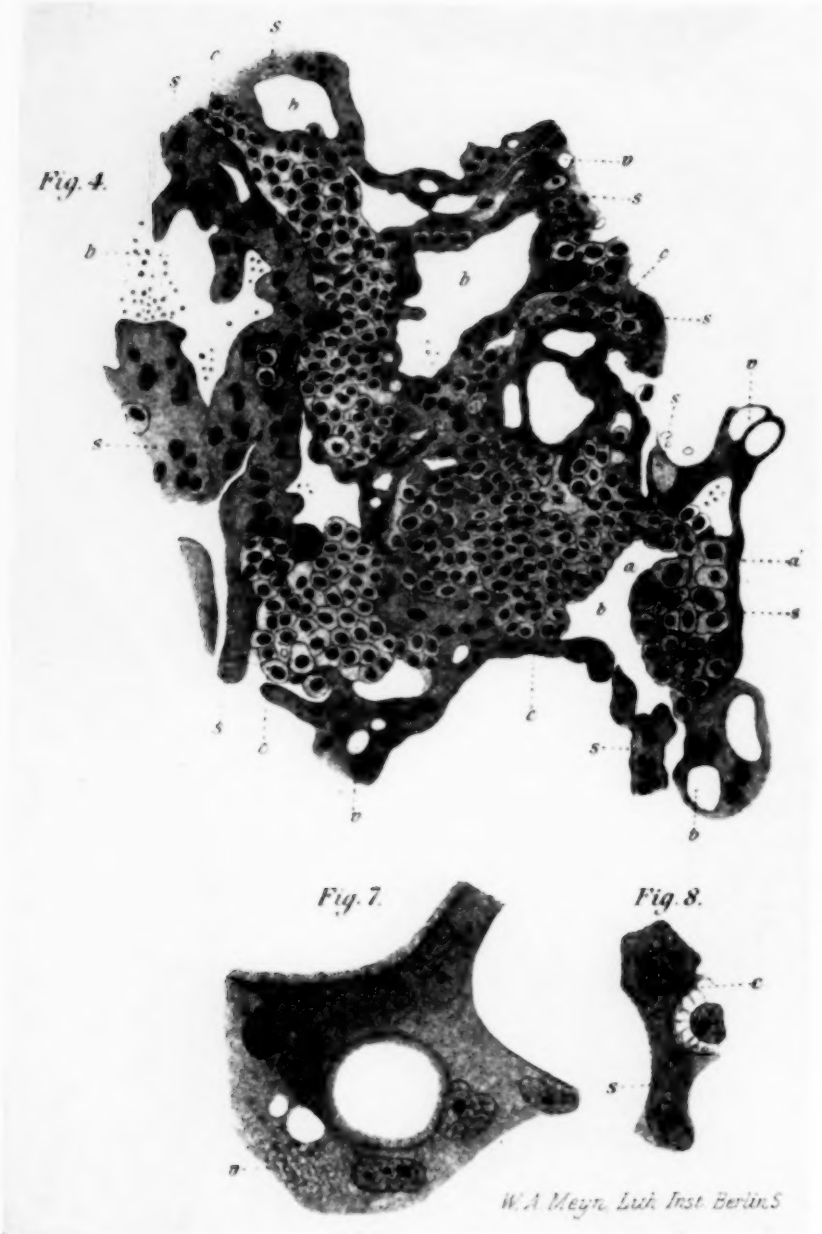

FIG. 3. Reproduction of a portion of the drawings used by Marchand[21] to illustrate the histologic appearance of choriocarcinoma. The large mass of cells (Fig. 4) shows clearly the arrangement of syncytiotrophoblast around islands of cytotrophoblast. The drawing at high magnification (Fig. 7) shows the brush border of syncytiophoblast, and the small detail (Fig. 8) shows a mitotic figure and cytoplasmic vacuolation.

FIG. 4. Reproduction of the drawing used by Marchand[82] to illustrate a case of choriocarcinoma. The primary tumor in the anterior and posterior walls of the uterus as well as the hemorrhagic nodules underlying the vaginal mucosa are clearly shown.

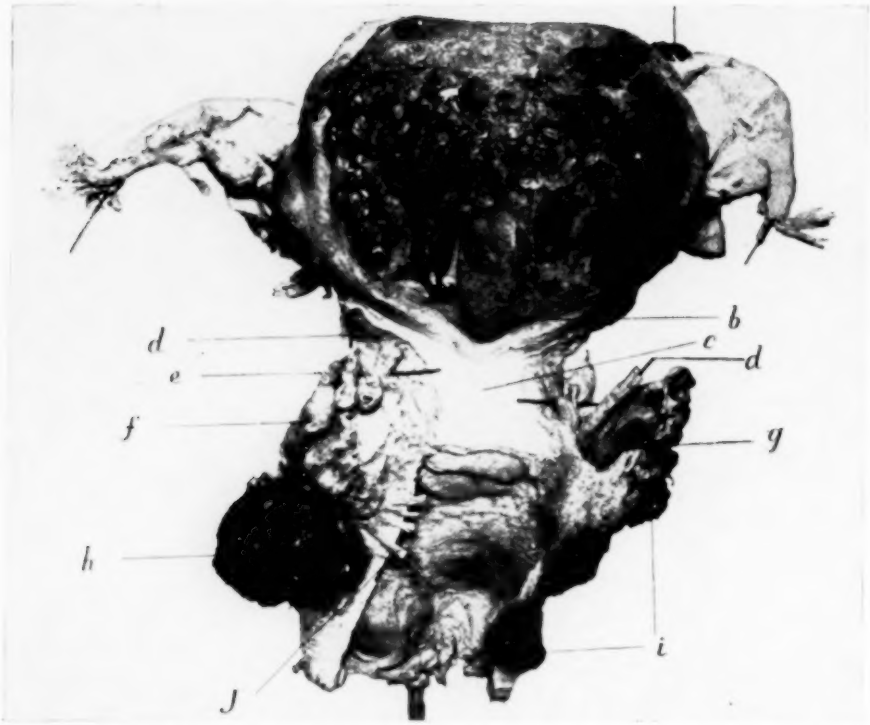

FIG. 5. Reproduction of the photograph of the gross specimen of the pelvic organs in the case reported by Kelly and Teacher.[22] The uterine corpus contains a large hemorrhagic and necrotic mass. The cervix uteri has not been opened. Metastatic nodules with hemorrhage are seen near the vagina.

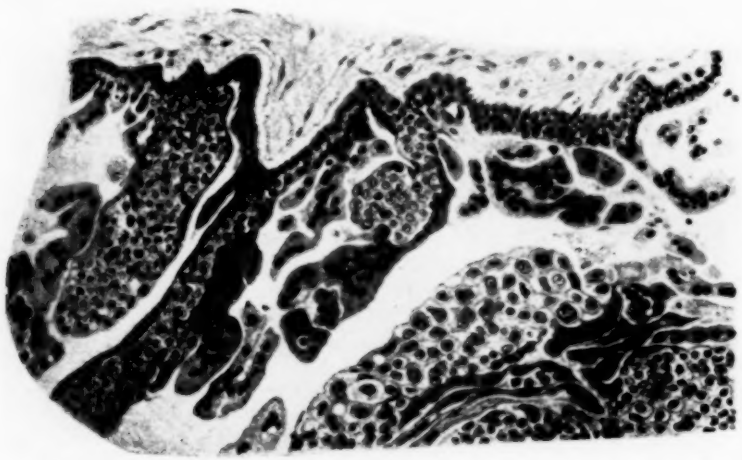

FIG. 6. Reproduction from Teacher[51] illustrating Haultain's case[15] of a chorioadenoma destruens. Proliferated trophoblast surrounds a molar villus. The accuracy of this drawing was challenged by Helme and defended by both Lockyer and Teacher.

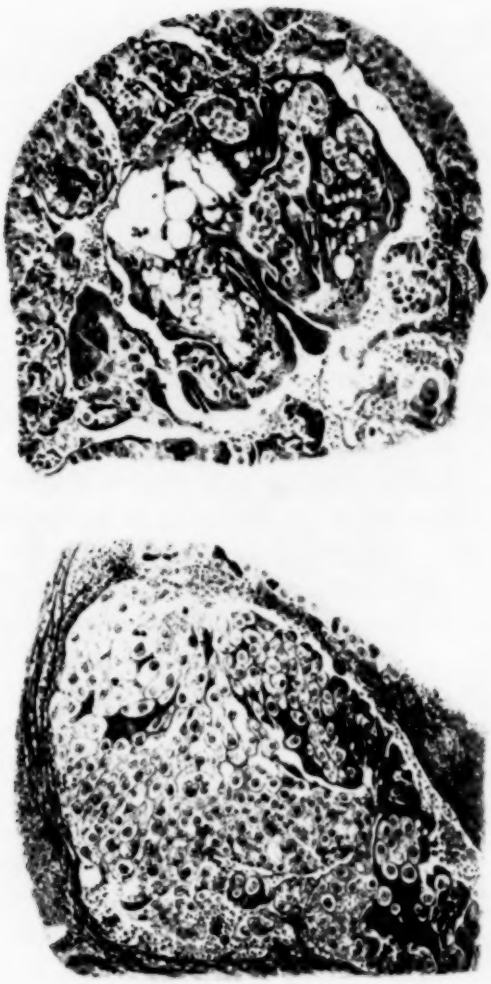

FIG. 7. Reproduction of drawings from Teacher[51] illustrating the case later reported by Munro Kerr and Teacher.[28] The upper drawing shows abundant syncytiotrophoblast with intracytoplasmic vacuoles surrounding small aggregates of cytotrophoblast. The lower drawing shows a relatively large number of cytotrophoblastic cells with a few interspersed syncytia.

chester operation for uterine prolapse. He put the question as follows:

> Can foetal epiblast . . . form new growths in the uterus and produce metastatic growths elsewhere? At present there is no proof that this can occur. Ordinary placental relics do not live after the death of the foetus. In ectopic pregnancy it has been shown that growth of the placenta after death of the foetus does not occur. Vesicular degeneration of the chorion is the most suggestive condition, and it is in connection with this that the required proof is most likely to be found. When it is found, the new 'chorionic carcinoma' will be welcomed, but not before. When it is recognized, it certainly will not be under the deceptive and unnecessary misnomer, 'deciduoma malignum.'

Sir John Bland Sutton, the leading English oncologist of his day, outlined Virchow's conception of tumor histogenesis that every tumor has its physiological prototype, saying that "if one were asked to enumerate the tumours likely to be expected in a given organ, it would merely be necessary to make a list of the various tissues composing it in order to answer the question." He stated that in his opinion a deciduoma was a sarcoma arising in decidual tissue and that he preferred to maintain an attitude of active scepticism concerning the other varieties supposed to originate in chorionic villi.

Spencer then rose to rebut Kanthack's attack on his own point of view. He stated that he had merely expressed his opinion that the tumor *appeared* to be a sarcoma, but that he had not really discussed its origin because he felt that further research was necessary. He pointed out that Kanthack had committed a *petitio principii* by assuming the syncytium of the chorionic villi to be epiblastic, a point which was not firmly established, and that Kanthack's statement that there was no evidence that the tumor was associated with pregnancy was not consistent with the evidence.

The discussion was concluded by T. Watts Eden who pointed out that the question of identity was "whether the placental syncytium possessed any specific characters by which it could be distinguished from masses of nucleated protoplasm derived from different sources." He himself believed that it did not have specific characters and that the plasmodial masses in the tumors could not be identified as syncytium merely from their microscopic appearances. He felt that the majority of cases were best classified as sarcomata, but he observed that there were a few instances in which the growth seemed to consist of proliferating chorionic villi and that "deciduoma malignum" would be an unsuitable term for growths composed of placental villi.

A committee was appointed to examine the cases presented by Malcolm,[29] Morison,[36] and Spencer.[48] This committee consisted of Drs. Kanthack, Bland Sutton, Spencer, Eden, Doran, Targett, and Griffith. The first four members have been briefly identified; Doran was a gynecologist and editor of the *Journal of Obstetrics and Gynaecology of the British Empire,* Targett was a gynecologist at Guy's Hospital, and Griffith was an obstetrician at St. Bartholomew's Hospital and at Great Northern Hospital. The only member of the committee who was a pathologist was Kanthack. Bland Sutton was primarily a surgeon whose monograph *The Pathology of Tumours* (1893) reflected his skill primarily as an oncologist and secondarily as a morbid anatomist. The remaining members were obstetricians and gynecologists. Their report was appended to the proceeding of the adjourned discussion in the meeting of 6 May. It read as follows:

> We, the undersigned, have met, and, after examining the specimens named above, have drawn up and signed the following report:
>
> 1. We are of the opinion that these cases are sarcomata, and therefore of connective-tissue origin, and they contain plasmodia identical in character with the so-called "syncytial masses" described by writers on deciduoma malignum. And the presumption is that they have arisen in maternal, not in foetal tissues; but there is no definite evidence before us bearing upon this point.
>
> 2. The specimens are remarkable from a histologic point of view for the presence in them of numbers of large cells and plasmodial masses. These elements, however, are by no means confined to cases of uterine sarcoma, but they may occur in sarcoma arising in other parts of the body. Sections of secondary growths in the liver and lymphatic glands from a case of sarcoma of the testis, containing precisely similar structures, were shown to the committee conjointly by Drs. Kanthack and Eden.
>
> 3. Secondary growths in Dr. Spencer's and Mr. Malcolm's cases showed the same character as the primary growth. There were no sections of secondary growth from Mr. Morison's case.
>
> We are of the opinion that there is nothing in the histologic characters of these specimens to justify the supposition that they are of decidual origin, and the term deciduoma malignum is therefore an inappropriate one.

On reading over the cases cited and the discussion they engendered, we may well ask: "Where did these distinguished men go astray? How can we explain the peculiar mixture of good observation and poor reasoning? What are we to make of the report of the Committee which says in one breath that the tumors are sarcomata arising in maternal connective tissue yet are not derived from decidua? If not from decidua, from what?"

The Committee's report shows that Kanthack's opinion prevailed. One observes the striking omission of any statement regard-

ing the association of the tumors with pregnancy, a matter with which Spencer taxed Kanthack severely in the adjourned discussion, and the restatement of the fact that syncytial masses were found in a testicular "sarcoma"—the one Kanthack had sent to Eden some time between 1 April and 6 May. However, Kanthack had committed himself to the view that the syncytia were derived from fetal epiblast. Did he now believe that they were merely adventitious components of a tumor derived from maternal connective tissue? If so, what, other than a constant association with pregnancy, could account for them? Apparently this point did not weigh heavily with the Committee. They had adopted another one of Kanthack's views, namely, that the plasmodial masses were merely tumor giant cells created by fusion of imperfectly dividing cells in a rapidly growing sarcoma. It is difficult to explain the Committee's decision that the tumors were of connective tissue origin yet not decidual. Applying Bland Sutton's argument that the possible tumors in an organ could be listed in equation with the number of different tissues found therein, this could leave only uterine smooth muscle, uterine blood vessels, or unaltered endometrial stroma as the source of such a sarcoma. Yet nowhere in the discussion are these possible tissues of origin mentioned, even to be excluded. The only correct inference that the Committee made was that the tumors are not decidual, yet they reach this conclusion largely against the opinion and ratiocination evident in the antecedent discussion, an example of *ignoratio elenchi*.

In extenuation of the Committee's shortcomings, it must be stated that the three cases under consideration were the first examples of gestational choriocarcinoma that any of them had ever seen. However, their reasoning leaves much to be desired. It is evident that they accepted Kanthack's testicular tumor as a sarcoma purely on his *a priori* judgment. (This was where Kanthack made his second error of *petitio principii*.) The testicular tumor contained syncytia (as well as other elements presumably), and today we would classify it as a teratocarcinoma with areas of choriocarcinoma.

In retrospect, it would appear to be the course of prudence for a society of clinicians to leave questions of the histogenesis and taxonomy of tumors to the morbid anatomists. Not only is this a good general rule, but it is especially so in the field of chorionic tumors where even experienced and informed pathologists find difficulty. However, the report of the Committee was predictable. From their remarks during the adjourned discussion it is evident

that Kanthack was convinced *a priori* that the tumor in question was a sarcoma, and Bland Sutton, Spencer, Eden, and Doran were leaning very strongly in that direction. In the absence of a strong advocate, Marchand's theory and the evidence upon which it was based received short shrift. This can probably be ascribed to the unsettled status of the embryological question regarding the origin of both layers of trophoblast despite the fact that Kanthack, Eden, and Spencer were convinced that both layers were fetal and had had the opportunity to hear Webster's cogent remarks to the same effect. Put in its baldest terms, "deciduoma malignum" was a sarcoma because the testicular tumor that Kanthack sent Eden was called a sarcoma. However, the Committee expressed its disapproval of the term "deciduoma malignum" for reasons which are obscure.

The opinion of the Committee of 1896 dominated the attitude of British observers for the next few years (Lewers,[24,25] Targett,[50] Julia Cock[8]). The first breach in the attitude of the British School was made in 1898 by Kelly and Teacher[22] in a report titled simply "A Case of Deciduoma Malignum." In this brief classic they state: "As will appear from the following description the name is not a good one for the particular tumour under consideration, which appears to have originated not from decidua, but from the epithelial cells covering the villi of the chorion." The photograph of the internal genitalia is reproduced (Fig. 5). The argument is straightforward and direct, dealing with the gross and microscopic features of the neoplasm and stating that the observations support the theory of histogenesis advanced by Marchand. There is no recapitulation of the controversy of 1896 nor reference to the report of the Committee.

However, a single case report is rarely enough to turn the tide. For example, the following year in Williamson's report[57] on hydatidiform moles, the relationship of mole to tumor is discussed with the implicit assumption that the tumor is nothing more than a variety of uterine sarcoma. Ludwig Fraenkel of Breslau attended this meeting as a visitor. He felt impelled to present the prevailing view of continental authorities, all of whom by then concurred with Marchand. Fraenkel's remarks are included in the report of the meeting, but none of the subsequent speakers bothered to debate the issue. Even two years later in 1901, Horrocks[16] reported a case of deciduoma malignum with cursory allusion to the 1896 decision as the source of authority for the name and nature of the tumor.

For the most part, in England the matter was regarded as settled along the lines of the Committee's report, except that the term "deciduoma malignum" still continued in vogue.

The year after Kelly and Teacher's article,[22] F. W. N. Haultain,[15] an obstetrician from Edinburgh, presented to the British Gynaecological Society the account of a case which we would now interpret as chorioadenoma destruens following a hydatidiform mole. Haultain concurred in the views of Teacher and Marchand, and some of his statements merit quotation:

> In seeking for an origin of this curious variety of growth, and at the same time recognising the fact, as pointed out by Sänger, that they always arise after an immediately pre-existing pregnancy, one naturally turns for a physiologic prototype to the placenta. . . . On microscopic examination the villi are found to be covered by two layers of epithelium, an inner composed of individual cells (Langhans' layer) and an outer of nucleated protoplasm not differentiated into cells (syncytium), and on comparing these layers with the cells of the tumour, which (as illustrated) display an intense activity in both layers of epithelium. . . . It cannot but be considered from the appearances . . . that the origin has been from the epithelial layer of villi.

It is evident from the foregoing that Haultain had a clear appreciation of the difficulties in establishing histogenetic connections. Neither he nor Marchand nor Apfelstadt and Aschoff recognized the taxonomic difference between a chorioadenoma destruens and a choriocarcinoma. Historically, this was a fortunate failure; it enabled the various observers to grasp the more important point that the proliferation and invasion of the epithelium covering chorionic villi were the significant element in the tumors. Haultain's photomicrographs of proliferated trophoblast around molar villi are even more convincing than the drawings appended to the articles by Marchand and by Apfelstadt and Aschoff.

In 1902 Cuthbert Lockyer (1867-1958) reported[26] to the Obstetrical Society of London "A Case of Chorioepithelioma with Pulmonary Metastases." He cited, as established, the fetal origin of both layers of chorionic epithelium and stated that "syncytial masses are capable of proceeding from a vesicular mole not only through the placenta but into the substance of the uterus."

The final blow to the report of the Committee of 1896 came at its meeting on 4 June 1903 when John H. Teacher presented his dissertation on Chorionepithelioma[51] which was published later that year in more extended form.[52] It is a recurrent theme in English intellectual history that the *pukka sahibs* are forever being saved from paying the price for their most abysmal *gaffes* by the

quick and ready wit of an Irishman or the sound common sense of a Scot.

In the earlier paper he demonstrated the Kelly-Teacher specimen of 1898[22] as well as two other cases and Haultain's drawings (Fig. 6). In his paper, Teacher traced the history of choriocarcinoma as knowledge of the entity had developed over the preceding 13 years. He also cited the growing body of embryological evidence since Hubrecht[17] to the effect that trophoblast was fetal in origin. He recapitulated the case reported by Kelly and himself and presented three new ones: a case sent him by Dr. John Edgar of choriocarcinoma developing after abortion, a similar case he had studied with Munro Kerr (Fig. 7), jointly published later that year,[38] and a case sent him by Dr. Elizabeth Pace of vesicular mole which showed only pronounced hyperplasia of the trophoblast. The argument that these tumors derived exclusively from chorionic epithelium and are of purely fetal origin was advanced on histopathological evidence, the morphological identity of the neoplastic cells being established by demonstration of transitions from normal to neoplastic trophoblast. Teacher stated that the only exact imitation of these cell forms he had seen was in teratomata. In his discussion of Schlagenhaufer's observation of apparent molar villi in testicular teratomata, he was at pains to point out that such structures had been described as carcinoma by Kanthack and Pigg.[21] Teacher did not commit himself to accepting Schlagenhaufer's observations regarding the villous nature of these structures, not having had the occasion to examine such a case himself. However, he did support the observation that trophoblastic tissue was truly present in teratomata, pointing out that its presence need not be limited to those arising in the testis but could appear in teratomata in any location.

The full-length version of Teacher's thesis[52] is more detailed, giving an extensive analysis of the preceding literature, an account of his visit to Germany in 1902 and the information he had obtained there, a comprehensive account of the status of knowledge regarding implantation, further details of the new cases he presented, and an expansion of the histopathological observations. This is followed by an annotated bibliography of the 189 cases of choriocarcinoma in the literature and citation of relevant source material regarding placentation, hydatidiform moles, and teratomata. In all important respects, Teacher's opinions were the same as Marchand's, and his thesis is the *locus classicus* in English for our

present ideas of the nature of the tumors in question. No serious alternative opinions have been advanced since that time.

In the discussion which followed, there was much heat. A distinct odor of phlogiston pervades the printed account. Peter Horrocks, an obstetrician at Guy's Hospital, pointed out that it was necessary to correct Teacher's statement that the Obstetrical Society had some years ago come to a conclusion on the matter, that the opinions of individual members did not commit the Society as a whole, and that the records would show the views of Kanthack, Eden, and others were not accepted. The only evidence to support this statement was in Lockyer's case report,[57] and the next speaker, Haultain, easily disposed of Horrock's feeble attempt at exculpating the Society, saying that "the individual members without exception committed themselves to the sarcoma theory; and naturally this was accepted by the Continental observers as the expression of British opinion, no other discussion on the subject having been published." Haultain pointed out that when he presented his own case in 1899 to the British Gynaecological Society,[15] the pendulum of British opinion had begun to swing toward the acceptance of Marchand's theory, largely influenced by the report of Kelly and Teacher's case.[22]

T. Arthur Helme, an obstetrician and gynecologist from Manchester, expressed surprise at the sweeping character of some statements in Teacher's paper. He said that

> Teacher ruthlessly brushes aside the maternal origin of those tracts of cells which are to be found in the intervillous spaces, and which we have looked upon as 'decidual' (maternal), and boldly says that they are all of trophoblastic or ovular production. . . . He [Helme] had failed to hear any evidence adduced by Teacher except the similarity of appearance of the cells—an unsafe basis of opinion—and a drawing of one of Dr. Haultain's preparations which had been shown upon the screen. This drawing had been 'made in Germany' and doubtless the artist had unconsciously allowed his imagination to tinge his product with the ideas he wished to represent.

Here we find the crux of the situation: namely, the statement that the appearance of the cells is an unsafe basis for opinion. While it is the experience of every morbid anatomist that cellular morphology can be misleading—and in respect to trophoblastic tumors it has misled and continues to mislead on occasion many distinguished observers—nevertheless, the histogenesis of tumors and their classification is one of the questions that can be solved only by the use of anatomical methods. If cellular appearances may be an unsafe basis for opinion, one may legitimately inquire as to who

is interpreting the morphology and what his experience and qualifications are. Marchand was the first pathologist who attempted to come to grips with the problem in any systematic way, and even he was delayed in the full evolution of his theory by the unsettled state of embryologic knowledge. He recognized this and proceeded to conduct embryologic investigations of his own to solve the question of maternal vs. fetal origin of syncytiotrophoblast, and despite the limited nature of his material he came up with the right answer. Helme's type of argument reappears from time to time; it is usually advanced by clinicians who fail to find morphologic support for a theory currently in fashion. While to be sure morbid anatomy has its limitations and can furnish answers to only certain classes of questions, problems of histogenesis are well within its limits, and it is temerarious for clinicians to challenge it in this respect. Surely, it is only by the utmost exercise of forebearance that pathologists refrain from inquiring of clinicians whether clinical signs and symptoms afford a safer basis for opinion. Helme's insular remark about the German provenance of Haultain's drawing (Fig. 6) was subsequently graciously answered by Teacher who said that "his (own) experience of our German colleagues was that they were a most kind and courteous lot of gentlemen, and as keen and conscientious seekers after truth as any men. In his inquiries he had encroached freely upon their time, and they had given it to him ungrudgingly. The race was doubtless no more free than any other from inaccurate and unreliable members, but his own observations had led him to the opinion that the latter got their deserts as surely and swiftly in Germany as anywhere else."[51]

Following Helme's comments, the meeting of 4 June was adjourned and the discussion resumed on 16 June. Herbert Spencer spoke first and was followed by Eden who observed that several of the preceding speakers had tried to dissociate themselves from the decision of the 1896 Committee and reminded Spencer that though he now professed always to have believed in the fetal theory, he had signed the Committee report. Eden owned himself "an unrepentant sinner" for his share of the Committee report. He pointed out that based on the evidence then available, the tumors shared many features in common with sarcomata and that in 1896 Marchand's theory was new and not supported by independent evidence. It was at this point that Eden failed to discriminate between the opinions of histogenesis by a number of clinicians and the demonstration of histogenesis by strict application of anatomical methods by

a morbid anatomist. He still felt that, given the facts then before them, the Committee's decision was proper. He pointed out that he had stated[9] that Marchand's theory could be proved by a satisfactory demonstration that the tumor arose from placental relics. He felt that this had now been demonstrated, and he freely admitted that the decision of the 1896 Committee was in error.

Lockyer concurred with Teacher's views, citing his own previously reported case and adding that he had examined five other cases since then which he would classify as chorionepithelioma. He stated that he had examined Haultain's specimen and had himself made a drawing from it; he was prepared to vouch for the faithfulness of the picture drawn by Teacher's German artist.

Teacher closed the discussion with a set of gracious remarks, stating that Eden's summing up had left little in the way of criticism to answer and expressed approval of Eden's "unrepentant sinner" attitude, charitably allowing that in 1896 the conclusions arrived at were most natural under the circumstances.

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Notes and Events

Edited by Dorothy M. Schullian*

First British Congress on the History of Medicine and Pharmacy

On 28-30 September 1960 the first British Congress on the History of Medicine and Pharmacy, organized by The Faculty of the History of Medicine and Pharmacy of the Worshipful Society of Apothecaries of London and sponsored by The Wellcome Foundation Limited, met in four sessions at Apothecaries' Hall, The Royal Society of Medicine, Apothecaries' Hall, and The Royal College of Physicians respectively. The President of the Congress was Dr. W. S. C. Copeman, the Honorary Secretary, Dr. F. N. L. Poynter, the theme, "The Evolution of Medical Practice in Britain." The proceedings will be published in the spring of 1961.

Professor Douglas McKie, Dr. Cuthbert Dukes, Dr. John Ellis, and Dr. R. R. Trail served as chairmen at the sessions. The following papers were delivered: F. N. L. Poynter, "The Influence of Government Legislation"; Charles Newman, "The Influence of Medical Education"; W. H. McMenemey, "The Influence of Medical Societies"; Ffrangcon Roberts, "Health Insurance Schemes and the Evolution of Medical Practice"; K. D. Keele, "The Influence of Clinical Research"; Sir Charles Dodds, "The Influence of The Royal College of Physicians"; Sir Zachary Cope, "The Influence of The Royal College of Surgeons of England"; Peter Laslett, "Patient and Doctor in Pre-Industrial England"; Michael Perrin, "The Influence of the Pharmaceutical Industry"; H. J. Malkin, "The Influence of The Royal College of Obstetricians and Gynaecologists"; R. M. S. McConaghey, "The History of Rural Practice in Britain"; Douglas Guthrie, "The Influence of Scotland upon the Evolution of British Medical Practice."

Dr. W. S. C. Copeman delivered the Presidential Address and Lord Cohen of Birkenhead the dinner address on 30 September. Historical exhibitions had been arranged by Mr. W. R. LeFanu and Miss Jessie Dobson at The Royal College of Surgeons of England, where a reception was held 29 September, and by Mr. L. M. Payne at The Royal College of Physicians. Awards of Honorary Fellowships were made at the first session to Sir Geoffrey Keynes and Professor Owsei Temkin.

Sesquicentennial Anniversary of the Founding of the Medical Institution of Yale College

In October, 1810, a charter was granted to the Medical Institution of Yale College by act of the General Assembly of Connecticut. That event,

* Cleveland, Ohio.

together with the subsequent development of the tiny and struggling institution into the universally respected Yale University School of Medicine of today, was appropriately celebrated in New Haven on 28-29 October 1960.

Vernon W. Lippard, George W. Pierson, and Frederick G. Kilgour presided at the three sessions. The main address, "Medical Science in the Twentieth Century," was delivered by Sir Howard Florey, Professor of Pathology at the University of Oxford. There were four additional papers on modern medicine—Vernon W. Lippard: "Medical Education at Yale in the Twentieth Century"; Averill A. Liebow: "Medical Research at Yale in the Twentieth Century"; C. N. H. Long: "Medical Science and the Future" (read by Arnold D. Welch); and Paul B. Beeson: "Clinical Medicine and the Future." At the historical session on 29 October Lloyd G. Stevenson traced the history of "Medicine in the Nineteenth Century" and Whitfield J. Bell, Jr., that of "The Medical Institution of Yale College in the Nineteenth Century." It was at this session and at the reception held in the Sterling Hall of Medicine on 28 October that the absence of John Fulton was especially felt.

A catalogue of *Exhibitions in Yale University on the Occasion of the Sesquicentennial Celebration of the School of Medicine* (New Haven, 1960, 60 pp.), listed the following: History of the School of Medicine—Medical Library; Selections from the Clements C. Fry Collection of Medical Prints and Drawings—University Art Gallery; Medicine from 1100 to 1700—University Library; Memorabilia of the Rev. Peter Parker, M.D. (1804-1888)—Brady Memorial Laboratory; Christian Missions and Medicine—Divinity School Library; History of Medical Jurisprudence—Law Library; Music and Medicine—Library of the School of Music; The Development of the Microscope—Peabody Museum. The New Haven Colony Historical Society and The New Haven Public Library also set up displays depicting early medicine in New Haven.

A second anniversary publication of permanent value is Frederick G. Kilgour's *The Library of the Medical Institution of Yale College and its Catalogue of 1865* (Yale Medical Library, 1960, 74 pp.), in which he ranks almost as co-author Courtney Smith Kitchel, a senior in Yale College who on 25 February 1865 completed the manuscript of the catalogue which is here printed for the first time.

As additional events in celebration of the sesquicentennial year a Symposium on World Medicine will be held on 17-18 March 1961 at the time of the dedication of the Mary S. Harkness Memorial Auditorium at the School of Medicine, and the Silliman Memorial Lectures entitled "Medical Science and Population Problems" will be delivered in April, 1961, by Dr. René J. Dubos of The Rockefeller Institute, New York.

Glossary of Historical Fever Terminology

A recurring problem for the medical historian is that of correlating old names for diseases with modern disease entities. When confronted with such puzzles as "gastrointestinal remittent hectic fever," "mucous fever," or "pneumo-enteritis contagiosa," one may feel quite justified in giving way to despair. The following list, compiled as a matter of convenience, may prove helpful in sorting out some of the names for one kind of diseases—the fevers. Multiple definitions are a reflection of the confusion in disease differentiation before the establishment of the germ theory. Readers are invited to contribute additions or corrections to this list. It is hoped that eventually a similar compilation may be made for the names of diseases which are not fevers.

A

ABDOMINAL TYPHUS FEVER—typhoid
ADYNAMIC FEVER—typhus
AFRICAN FEVER—malaria
AGUE—malaria
AGUE AND FEVER—malaria
ANGINA SUFFOCATIVA—diphtheria

B

BARBADOS DISTEMPER—yellow fever
BILIOUS FEVER—typhoid; malaria
BILIOUS OR RECURRENT FEVER—relapsing fever
BILIOUS REMITTENT FEVER — malaria; undulant fever
BLACK DEATH—bubonic plague
BLACK FEVER—leishmaniasis
BLACK VOMIT—yellow fever
BLOODY FLUX—dysentery
BRAIN FEVER—epidemic cerebrospinal meningitis
BREAKBONE FEVER—dengue

C

CALENTURE—yellow fever, deficiency diseases
CAMP FEVER — typhus; typhomalarial fever (obsolete)
CEREBROSPINAL FEVER — epidemic cerebrospinal meningitis
CHANGRES FEVER—malignant malaria
CHARBON—anthrax
CHICAHOMINY FEVER—typhomalarial fever (obsolete)
CHILDBED FEVER—puerperal sepsis
CHILL FEVER—malaria
CHIN COUGH—whooping cough
CHOLERA—cholera Asiatica
CHOLERA MORBUS—24-hour flu
COLD PLAGUE—epidemic cerebrospinal meningitis
CONGESTIVE FEVER—typhoid; epidemic cerebrospinal meningitis
CONSUMPTION — tuberculosis of the lungs; cancer of the lungs
CONTINUED FEVER—typhoid
COUNTRY FEVER—malaria

D

DANDY FEVER—dengue
DEVIL'S GRIP—infectious pleurodynia
DOTHINENTERIA—typhoid
DUMDUM FEVER—leishmaniasis

E

EIGHT DAYS' SICKNESS—tetanus
ENTERIC FEVER—typhoid
EPHEMERAL FEVER—febricula
EPIDEMIC DIAPHRAGMATIC SPASM—infectious pleurodynia
EXANTHEMATIC TYPHUS—typhus

F

FAMINE FEVER—relapsing fever
FEVER AND AGUE—malaria
FLOOD FEVER—Tsutsugamushi fever
FLUX—dysentery
FRAMBOESIA—yaws
FRENCH POX—syphilis

G

GAOL FEVER—typhus
GENESEE FEVER—malaria
GLANDULAR FEVER—infectious mononucleosis
GREAT POX—syphilis

H

HECTIC COMMON INFLAMMATORY FEVER—advanced tuberculosis of the lungs
HECTIC FEVER—fevers from pyogenic infections; advanced tuberculosis of the lungs
HIS-WERNER DISEASE—trench fever
HOSPITAL FEVER—typhus
HOSPITAL GANGRENE—fusospirochetal disease
HUNGARIAN FEVER—malaria

I

ILEO-TYPHUS FEVER—typhoid
INFLAMMATORY FEVER—fevers from pyogenic infections
INTERMITTENT FEVER—malaria
IRISH FEVER—typhus; relapsing fever

J

JAIL FEVER—typhus
JAPANESE RIVER FEVER—Tsutsugamushi fever
JUNGLE FEVER—malaria

K

KALA-AZAR—leishmaniasis
KENTISH DISORDER—malaria

L

LAKE FEVER—malaria
LOCKED JAW—tetanus
LUNG FEVER—pneumonia

M

MALIGNANT BILIOUS FEVER—yellow fever
MALIGNANT FEVER—malaria
MALIGNANT PUSTULE—anthrax
MARSH FEVER—malaria
MEDITERRANEAN FEVER — undulant fever
MEMBRANOUS CROUP—diphtheria
MIXED FEVER—typhus

N

NERVOUS FEVER—mild typhus

P

PALUDAL FEVER—malaria
PAPPATACI FEVER—phlebotomus fever
PESTILENTIAL FEVER—typhus
PETECHIAL FEVER—epidemic cerebrospinal meningitis
PHTHISIS—tuberculosis of the lungs
PLAGUE—bubonic plague
PUTRID FEVER—typhus
PYTHOGENIC FEVER—typhoid

Q

QUINTAN FEVER—trench fever

R

RECURRING FEVER—relapsing fever
REMITTENT FEVER—malaria

S

ST. ANTHONY'S FIRE—erysipelas
ST. VITUS'S DANCE—acute chorea
SANDFLY FEVER—phlebotomus fever
SCARLATINE RHEUMATICA—dengue
SCROFULA—tuberculosis of the lymph glands
SEPTIC FEVER—fevers from pyogenic infections
SEVEN DAY FEVER—relapsing fever; disease caused by leptospira hebdomadis
SHIN-BONE FEVER—trench fever
SHIP FEVER—typhus
SLEEPY SICKNESS—epidemic encephalitis
SORE THROAT DISTEMPER — diphtheria
SPIRILLUM FEVER—relapsing fever
SPLENIC FEVER—anthrax
SPOTTED FEVER — typhus; epidemic cerebrospinal meningitis
SPOTTED TYPHOID—typhus
STRANGER'S FEVER—yellow fever
SWEATING SICKNESS—miliary fever
SYDENHAM'S CHOREA—acute chorea
SYNOCHUS FEVER—fever from pyogenic infections; typhoid
SYNOCHUS-HECTICA—typhoid
SYNOCHUS PUTRIS—yellow fever

T

TABARDILLO—typhus
THREE-DAY FEVER—phlebotomus fever
TICK FEVER—Rocky Mountain spotted fever
TYPHOID AFFECTION OF LOUIS—typhoid
TYPHOMALARIAL FEVER — obsolete combination of typhoid and malaria; (rarely) Rocky Mountain spotted fever
TYPHOUS FEVER—typhoid
TYPHUS BILIOSUS—infectious jaundice
TYPHUS GRAVIOR—typhus
TYPHUS ICTEROIDES—yellow fever
TYPHUS MITIOR—typhoid
TYPHUS PETECHIALIS—epidemic cerebrospinal meningitis

U

ULCERATIVE ANGINA—diphtheria

V

VARIOLA—smallpox

W

WALCHERN FEVER—malaria
WHITE SWELLINGS—tuberculosis of the bones
WOLHYNIAN FEVER—trench fever
WOOL-SORTER'S DISEASE—anthrax

Y

YELLOW JACK—yellow fever

PHYLLIS A. RICHMOND

Historical Notes in the American Journal of Cardiology

The *American Journal of Cardiology* plans to continue the historical notes begun in 1958. Earlier titles were listed in this journal (1959, *14*, 90-91 and 1960, *15*, 85). Articles scheduled to appear during 1961 are as follows:

Right-sided Ulcerative Endocarditis Recognized Ante Mortem (Charcot and Vulpian, 1862)—February.
William Halsted on Refusion of Blood in Carbon Monoxide Poisoning (1883)—April.
Coarctation of the Aorta (Meckel, 1750; Paris, 1791)—June.
Coarctation of the Aorta (Robert Graham, 1814)—August.
John Eberle's Lectures on Medicine (1827)—October.
Coarctation of the Aorta (Otto, 1824; Bertin, 1824)—December.

Each note reproduces wholly or in part the text of an interesting contribution to the development of cardiological knowledge, accompanied by suitable introductory and explanatory material designed to place the material in its historical background.

SAUL JARCHO

The Cole Library, Reading University

Announcement was made in August, 1960, that Reading University had acquired the library, consisting of 8,000 volumes on the history of zoology, which was bequeathed by Professor F. J. Cole (1872-1959) to Dr. N. B. Eales.

The library forms a splendid complement to the Cole Museum of Zoology, already housed in the Zoology Department. The books will remain in Professor Cole's home, under the care of Dr. Eales, until the completion of the University's new library building in Whiteknights Park where a special room will be set aside for them. Acquisition of the collection was facilitated by a bequest to the University from its former Librarian, the late Dr. Mary Kirkus.

Professor Cole was a Consulting Editor of this journal, which published a tribute to him and a brief description of his library by Dr. Eales (1959, *14*, 267-272). He began buying books out of his lunch money when he was still a boy and collected them all his life. Something of his joy and of his methods in acquiring them is clear from his own earlier article in the Journal (1958, *13*, 2-9).

Historical Gleanings

On 23 December 1924 Raymond A. Dart, who was Professor of Anatomy at the University of the Witwatersrand from 1923 to 1958, uncovered in South Africa the fossil skull of a baby which he identified as *Australopithecus*. He relates in *Adventures with the Missing Link* (New York, Harper & Brothers, 1959), with the help of Dennis Craig, the circumstances of this discovery. *Zinjanthropus*, the East African man who lived more than 600,000 years ago, is the subject of an article in the *National Geographic Magazine*, 1960, *118*, 420-435 by L. S. B. Leakey, Curator of the Coryndon Museum in Nairobi, Kenya.

There are many references in John Davies Evans's *Malta* (New York, Frederick A. Praeger, 1959) to the archaeological activities of Dr. (later

Sir) Temistocle Zammit, Director of the Malta Museum and Rector of Malta University, who early in this century laid the solid foundations of present knowledge of Maltese prehistory. His *Prehistoric Malta: the Tarxien Temples* was published by the Oxford University Press in 1930. He had earlier gained an international reputation in the field of preventive medicine; among the findings of the Mediterranean Fever Commission published in 1905-1907 (Garrison-Morton 5102) probably the most important was his demonstration that goats' milk was the main source of infection.

The *American Journal of Archaeology,* 1960, *64,* 182 carries a summary of a paper on civilization and dental disease by J. Lawrence Angel (cf. Journal, 1958, *13,* 414). Examining remains of 1,000 mouths from Greece dated from Neolithic to modern times, he found that dental lesions averaged 5-7 per mouth (20%) to the Early Iron Age, 4 (15%) in classical times, 20% again in Turkish times, and a sudden 40% in the 19th century. The final sharp deterioration he links with the increase of sugar in the diet and the use of modern milled flour. Excellent teeth are still common in poor and isolated areas.

In *Hesperia,* 1959, *28,* 169-201 and Plates 35-39, Rolf O. Hubbe presents 13 "Decrees from the Precinct of Asklepios at Athens." Those who would read them must know their Greek.

Harold W. Miller, examining in *Transactions of the American Philological Association,* 1959, *90,* 147-164 the concept of *dynamis* in the medical work of the Hippocratic *Corpus* entitled *De victu,* concludes that on the basis of the use of *dynamis* in it the tract can be dated within the first half of the 4th century B.C.

Gerald Clark, chief foreign correspondent for the *Montreal Star* and co-author and narrator of CBS's "The Face of Red China," visited Red China in 1958. On pages 128-138 of his book *Impatient Giant: Red China Today* (New York, David McKay Company, Inc., 1959) he discusses the resurgence of traditional medicine there and describes the persistence of acupuncture, moxibustion, and herbal remedies in hospitals which contain also the latest in modern medical equipment. Traditional medicine is discussed also in Peggy Durdin's article "Medicine in China: a Revealing Story" (*The New York Times Magazine,* 28 February 1960, p. 17) and for a less modern China by G. R. G. Worcester in *The Junkman Smiles* (London, Chatto and Windus, 1959), pp. 64-70. Mr. Worcester was for many years an officer of the Chinese Maritime Customs.

Paul Oskar Kristeller has contributed a note entitled "Beitrag der Schule von Salerno zur Entwicklung der scholastischen Wissenschaft im 12. Jahrhundert" to *Artes liberales von der antiken Bildung zur Wissenschaft des Mittelalters,* edited by Josef Koch, Leiden, 1959 (*Studien und Texte zur Geistesgeschichte des Mittelalters,* Bd. 5), pp. 84-90. He is of the opinion

that for the late mediaeval and the Renaissance periods medicine and philosophy complement one another and should be studied together for a better understanding of both.

Loren C. MacKinney continues his study of medical miniatures with an article in *Speculum,* 1960, *35* entitled "A Thirteenth-Century Medical Case History in Miniatures." The MS. in question is Ashmoleanus 399 at the Bodleian, in which are inserted two folios containing the eight now famous illustrations on the ailing lady. Professor MacKinney, taking into account the interpretations of Sudhoff, Singer, and others, would make of all eight a unit. He provides on pp. 251-256 a reproduction and detailed description of each; there follows a stylistic analysis of the miniatures by Harry Bober of the Institute of Fine Arts, New York University.

In a discussion of the relations between Petrarch and Manno Donati, Ernest Hatch Wilkins *(Speculum,* 1960, *35,* 390-392) examines the evidence on the date of death of Tommaso del Garbo. Statements in one of Petrarch's letters and in the diary of Monaldi which assign it to the year 1370 may be mistaken reports of the death; Florentine tax records indicate that payments were made on Tommaso's behalf on 14 August 1371 and on 15 October 1373, but on behalf of his heirs on 13 February 1375 (1374, Florentine style). Petrarch, Manno Donati, and Tommaso del Garbo served as godfathers to Francesco di Bivigliano degli Alberti, who was baptized in Padua in 1371.

In the Festschrift for John G. Kunstmann entitled *Middle Ages—Reformation—Volkskunde* (Chapel Hill, 1959) Robert W. Linker examines on pages 95-100 the medical interests of the poet Charles d'Orléans (1391-1465).

Harcourt Brown's paper "The Renaissance and Historians of Science" (*Studies in the Renaissance,* 1960, *7,* 27-42) makes the important point that although the history of science can be illustrated, it cannot be told in picture-book form.

An exhibition of the work of the printer and publisher Johannes Froben (c.1460-1527) was held 19 June-24 July 1960 in the Gewerbemuseum of Basel on the occasion of the 500th anniversary of that city's University. Froben contributed much to the fame of Basel as a center of humanism. Products of such printers as Amerbach, Cratander, and Oporinus were set beside his in the exhibition. Among the 108 items on display were the 1543 and 1555 editions of Vesalius by Oporinus and the second volume of the works of Galen, 1538, by Johannes Bebel, from the Cratander-Bebel-Isengrin edition. Page 315 [415] of the 1543 Vesalius is reproduced in the attractive catalogue entitled *Johannes Froben und der Basler Buchdruck des 16. Jahrhunderts* (20 unnumbered leaves, 13 plates).

It is always a joy and a relief when an authoritative biobibliography is issued for an individual of importance in the history of medicine. This was

done for Dr. Heinrich Wolff (1520-1581) in the inaugural dissertation presented at the University of Würzburg in 1959 by Wolfram Brechtold (294 pp., portr., 27 illus.). Dr. Robert Herrlinger supervised the dissertation; both his biography of Volcher Coiter (Nürnberg, 1952) and this writer's remarks in the Journal, 1951, *6*, 182-183 had set forth the relations of Wolff with Coiter. The dissertation provides from printed, manuscript, archival, iconographical, and epigraphical evidence a careful and detailed study of Wolff's life and works. It is of value also for the light it throws on individuals whom his career touched and on medicine in 16th-century Nürnberg.

At the "Floriade," the international horticultural exhibit covering 125 acres which was held at Rotterdam 25 March-25 September 1960, one of the displays was a replica of the garden of Charles de l'Écluse, who was professor of botany at Leiden from 1594 to 1609. It was he who, four hundred years ago, received the first tulip bulb which was brought to Holland from Constantinople by the diplomat Ogier Ghislain de Busbecq.

The titles of his manuscripts mentioned by William Harvey himself and by Sir Charles Scarburgh, John Aubrey, and Charles Goodall total 18, only 2 of which are now known to be extant. Frederick G. Kilgour has published the list in the *Papers of the Bibliographical Society of America*, 1960, *54*, 177-179 with the hope that continued searching will turn up more titles and, particularly, more manuscripts.

The exhibition *Restoration Life and Letters,* held 26 May-22 July 1960 by the National Book League, London, displayed 210 volumes in the broad fields of realm and people, science and medicine, verse and drama, and ceremonies and the theater. The second group numbered 59 items among mathematics, astronomy, physics, chemistry, geology, biology, botany, zoology and comparative anatomy, anatomy and physiology, "medicine, etc.," and the Royal Society; the latter selection was made by Sir Harold Hartley and Sir Charles Dodds. A neatly printed catalogue of 44 pages set forth the significance of each item.

The medical and scientific interests of the archdeacon Thomas Plume (1630-1704) may be judged from the *Catalogue of the Plume Library at Maldon, Essex* (Maldon, Plume Library Trustees, 1959) compiled by S. G. Deed assisted by Jane Francis. It carries a foreword by F. C. Francis, Director and Principal Librarian of the British Museum. Plume was a scholar with wide interests in all fields of learning, and the catalogue is "a guide to the taste and interests of a widely read man and to the culture of the seventeenth century."

Jens Nyholm has reviewed in the *Library Quarterly*, 1960, *30*, 154-156 the publication *Fund og Forskning i Det Kongelige Biblioteks Samlinger*, 1958-1959, *5-6* (Copenhagen, Royal Library, 1959, 239 pp.). He calls attention to Gustav Scherz's contribution concerning the original manuscript of

Niels Stensen's *Elementorum myologiae specimen.* The manuscript appeared on the market in Italy in 1954 at a prohibitive price, was offered again in California somewhat more reasonably in 1957, was acquired by the Nordic Insulin Laboratory, and was happily transferred to the Royal Library as a gift.

The article on the naturalist Mark Catesby (1679?-1749) by George F. Frick in the *Papers of the Bibliographical Society of America,* 1960, *54,* 163-175 includes discussion of his relations with the physician Samuel Dale (1659?-1739) and the naturalist George Edwards (1694-1773), who in 1733 was appointed librarian of the Royal College of Physicians. Catesby's best known work is *The Natural History of Carolina, Florida, and the Bahama Islands.*

Thomas Falkner (1707-1784), who studied medicine with Richard Mead and practised in Manchester, was advised about 1730 to take a sea voyage for reasons of health and obtained the post of surgeon on a ship of the South Sea Company which was to convey a group of slaves from Guinea to Buenos Aires. It appears that he also carried a commission from the Royal Society to study the medicinal properties of American waters and herbs. On 14 May 1732 he entered the Jesuit province of Paraguay; he was ordained priest in 1739 and thereafter combined missionary and medical activities on the Pampa plains until the expulsion of the Jesuits from Paraguay in 1767. R. F. Doublet narrates his career in the article "An Englishman in Rio de la Plata" in *The Month,* 1960, n.s. *23,* 216-226. Falkner's book *A Description of Patagonia and the Adjoining Parts of South America . . . ,* which was published in Hereford in 1774 apparently without his knowledge and in which William Combe had a hand, was used as a textbook by King, Fitzroy, and Darwin on the *Beagle.*

Roland Bartel, discussing "Suicide in Eighteenth-Century England: The Myth of a Reputation" in *The Huntington Library Quarterly,* 1960, *23,* 145-158, concludes that although suicide was commonly referred to in this period as the great English malady, sensational accounts in the newspapers were misleading and that "the reputation of the English as a suicidal people has been greatly exaggerated."

The great *Survey of London* edited by F. H. W. Sheppard (mentioned in the JoJurnal, 1959, *14,* 102) has progressed to Volume 28, Parish of Hackney (Part I), Brooke House (1960). In 1758-1759 William Clarke converted Brooke House into a private lunatic asylum, which it remained until the bombs of 1940 destroyed it beyond hope of restoration. On pages 64-66 Mrs. Marie P. G. Draper documents the relations of the Monro family with the asylum; the patients were drawn from the middle and upper classes, "and although their treatment by cold baths, bleeding and purging was similar to that in use at Bethlem they were not restrained by chains."

Thomas Monro, in fact, stated in 1815 that the use of chains was "fit only for pauper lunatics; if a gentleman was put in irons, he would not like it."

The medical and political activities of Dr. James Tilton are discussed by Thomas R. Adams in the Annual Report of The John Carter Brown Library, 1 July 1959 (Providence, 1959), pp. 30-32. The report also notes the acquisition of a copy of Diego Osorio y Peralta, *Principia medicinae* (Mexico, 1685).

A. W. Langford in *Transactions of the Woolhope Naturalists' Field Club, Herefordshire* (1960, *36,* Part 2), discusses the history of the Hereford General Hospital, which opened its permanent home in 1783.

On 11 June 1960 Luigi Belloni delivered at the Palais de la Découverte, Université de Paris, a lecture entitled "Le *Contagium Vivum* avant Pasteur."

The stirring events of 1859 on the Lombard plain, so significant for the independence of Italy, led also, after San Martino and Solferino, to the birth of the International Red Cross. They were commemorated at Milano on 31 May 1959 at a gathering of the Centro Lombardo dell'Accademia di Storia dell'Arte Sanitaria and of the Società Lombarda di Scienze Medico-Biologiche. The following papers introduced by Luigi Belloni (published in *Minerva Medica,* 18 aprile 1960, *51,* Suppl. to No. 31, 40 pp.) were delivered: Angelo Carimati, "Innovazioni balistiche, ripercussioni traumatologiche, organizzazione sanitaria militare"; Pier Franco Peregalli, "Problemi chirurgici della campagna del 1859"; Bruno Zanobio, "Profilassi delle infezioni delle ferite"; Enrico Poli, "Il primo tentativo di terapia curarica del tetano"; Felice Grondona, "Gli Ospedali Militari di Milano e di Brescia nel 1859"; Vittorio Ghetti, "Nascita della Croce Rossa"; L. Belloni, A. Carimati, F. Grondona, "Spunti di patologia all'Ossario di Solferino."

Austria issued a single stamp to commemorate the 100th anniversary of the birth, on 31 July 1960, of Dr. Anton von Eiselsberg (d. 1939) whom F. H. Garrison in 1929 called the "leading surgeon of Austria." A pupil of Billroth, he noticed early the appearance of tetany after operations for goiter. One outstanding contribution of his is listed as Garrison-Morton 3856.

The 100th anniversary of the birth of Leonard Wood, soldier and statesman, occurred on 9 October 1960. In the renown of his subsequent career it is sometimes forgotten that in 1884 he received the M.D. degree from the Harvard Medical School and that in 1886 he entered the army as lieutenant and assistant surgeon. As military governor of Cuba from December 1899 to May 1902 he worked with great success to improve sanitary conditions on the island.

Frank Rowsome, Jr. has provided an informal history of advertising, in words and pictures, in his book *They Laughed When I Sat Down* (New

York, McGraw-Hill Book Co., 1959). One chapter, "Shake Well before Using," deals with advertisements for patent medicines, another with breakfast cereals.

Some of the proverbs on health and diseases included in the Tuscan collection of Giusti (Journal, 1957, *12*, 402), together with others of purely Roman provenience, are provided in the pungent Romanesque dialect in Giggi Zanazzo's *Proverbi romaneschi. . .*, a cura di Giovanni Orioli (Roma, Staderini, 1960, under the auspices of the Istituto di Studi Romani), pp. 240-243.

In his teasing article "The Literary Treatment of Insomnia" *(Punch,* 15 June 1960, p. 838) Saul Jarcho suggests certain works of literature which could be as effective in producing sleep as the somniferous drugs now consumed in such quantities.

At the age of 33, Fred B. Rogers has been appointed Professor of Preventive Medicine and Epidemiology to become the youngest full professor on the staff of the Temple University School of Medicine.

Professor Charles Upson Clark, classicist, lecturer, and author, died on 29 September 1960 at the age of 85.

In 1936 The Heberden Society was founded for the advancement of the study of rheumatic diseases. A new edition of the catalogue of its library, housed at The Ciba Foundation, 41 Portland Place, London, W.1, was issued in the fall of 1960. It lists on 39 pages about 300 items published prior to 1914 on rheumatism, gout, arthritis, and similar disabilities. The Honorary Librarian is W. S. C. Copeman.

The scholar who would collect source material for his own use has reason to be appalled as prices in the rare book market spiral ever higher. Some 300 early medical and scientific books collected by the late Dr. Archibald Gilpin and including such names as Auenbrugger, Bright, Cesalpino, Colombo, Estienne, Glisson, Highmore, Jenner, Laennec, Paré, Röntgen, Servetus, Vesalius, and Withering realized the sum of £16,989 at Sotheby's on 30 May 1960. A letter of 6 February 1784 from Samuel Johnson to his physician Dr. Heberden was sold for £260 at Christie's on 20-21 July.

On 18 May 1960 Seymour S. Kety delivered at the National Institutes of Health a lecture entitled "The Biologist Examines the Mind and Behavior." It included an allegory on workings of the scientific method in which a million books appear suddenly in the midst of a highly intelligent and civilized community which had never before seen a book. In curiosity and consternation the inhabitants set up an institute to investigate these objects scientifically, and anatomists, chemists, analytical chemists, biochemists, molecular biologists, physiologists, biophysicists, behavioral scientists, and psychoanalysts examine them with the tools, techniques, and concepts of their

respective disciplines. Dr. Kety's paper appeared in *Science* (23 Dec. 1960) and the entire parable, which is both delightful and disquieting, can be perused with profit by all historians and scientists. Suffice it to quote here the description, already something of a classic, which the anatomists give of a book: "The specimen is a roughly rectangular block of tissue covered ventrally and dorsally with two coarse, fibrous, encapsulated laminae approximately 3 mm. thick. Between these lie several hundred white laminae a fraction of a millimeter thick, all fastened at one end and mobile at the other. On closer inspection of a few of these, they are found to contain a large number of black surface markings arranged in linear groupings in a highly complex manner."

Book Reviews

SIR HAROLD HARTLEY, Editor. *The Royal Society, its Origins and Founders.* London, The Invicta Press, 1960. 275 pp., 29 plates, $6.00. [Also, *Notes and Records of the Royal Society,* Tercentenary Number, vol. 15, July 1960.]

E. N. DA C. ANDRADE. *A Brief History of the Royal Society.* London, The Royal Society, 1960. 28 pp., 14 plates, $2.00.

Reviewed by DOROTHY STIMSON, *Professor Emeritus of History, Goucher College.*

THE Royal Society of London, the oldest scientific society in the English-speaking world, in 1960 celebrated the 300th anniversary of its founding. To provide permanent memorials of the occasion, the Society has published two books. One, perhaps, is intended to answer the question, "What is the Society and what does it do?" The other, larger, one has the avowed purpose "to praise famous men and our fathers that begat us." Sir Harold Hartley, its editor, has assembled a remarkably unified compilation of 21 short biographical sketches preceded by a somewhat longer account of the Society's origins by Douglas McKie and followed by a short Epilogue by the Editor. Fifteen of the fine illustrations are portraits of the subjects; except for two, the others are connected with the subjects' work. The portrait of Sir William Petty is especially interesting as the removal in 1958 of old over-painting has revealed the skull he is holding and two more in the open book before him. One of the two exceptions is a plate of Gresham College, the background of the early Society. The other is a drawing made in 1680 of the floor plan of Whitehall, a veritable rabbit-warren of a palace, with the locations of present buildings superimposed on it.

Among the authors of the sketches are Dr. John F. Fulton, on Boyle and on Sir Kenelm Digby, and Professor Andrade on Robert Hooke. (The editor in his Preface gives special recognition to these two men for their assistance throughout the volume.) The sketches begin with Charles II as Founder and Patron and conclude with the second Earl of Kincardine, Alexander Bruce. The rest are the well-known clergymen, doctors, courtiers, and public servants who were lovers of the "new philosophy" even if not scientists themselves. Sir Christopher Wren fares best with two sketches: one by Sir John Summerson on Wren as president of the Society, the other by Derek T. Whiteside on Wren as mathematician. In addition a long letter by him from the Society's archives is included in the life of Sir Paul Neile. Wren's biographers consider that there is as yet no adequate biography of him. Similarly, Professor Andrade holds that as Hooke's importance in science has only recently been appreciated, a new biography is much needed.

Wherever possible, the writers have used manuscript sources (in many cases the Society's archives) with a consequent freshness that adds to the interest of the sketches.

The Society's archives have since World War II been classified, catalogued, boxed, and filed to make them readily available. Scholars may indeed be thankful that these manuscripts have been rescued from the dusty oblivion they rested in even as recently as 1931 when this reviewer used some of them, and that now much fresh material is accessible. (See the "Guide" to them by their cataloguer, K. K. Bluhm, also author of the Oldenburg sketch, *Notes and Records of the Royal Society*, 1956, *12*, 21-39.)

In his account of the origins of the Royal Society, Professor Douglas McKie holds that the important role Gresham College and its professors played in its early days has not hitherto been sufficiently recognized. Its rooms were not only the meeting-place but four of its seven professors were among the group of twelve who agreed on 28 November 1660 to organize. A fifth, William Croone, who was absent that day, was included also. Professor McKie also emphasizes the Royalist connections of many of these men, thereby disagreeing with American scholars like R. F. Jones and Robert Merton who have pointed out the part Puritanism, in their opinion, played in the growing interest in experimental work. Perhaps the truth lies somewhere between these two positions. As the Society was organized in Restoration days, its members would not have emphasized previous Puritan relationships: but some like Wilkins, Wallis, and Goddard had been Parliamentary appointees, and many had had strong Puritan influence in their educational backgrounds. Such influence was strong when in 1645 the informal meetings out of which the Society developed were under way.

The editor, Brigadier-General Sir Harold Hartley, a distinguished physical and industrial chemist now in his eighties, president of the British Association for the Advancement of Science in 1950 and of other professional organizations at various times, himself elected F.R.S. in 1927, has for the past couple of years been editor of the Society's *Notes and Records*. In addition to the Epilogue he is listed as co-author of four of the lives. In the Epilogue he gives an indication of the Society's distinction in the succeeding centuries through the work of its most outstanding members, since "the most important activity of the Royal Society is not an organized one at all: it is simply the sum total of all that the individual Fellows do in their own right. . . . The Fellows are the Society and the Society is the Fellows." He also comments upon the influence the original Fellows had upon English style in furthering the shift from Latin to the vernacular for scientific communications, in using a plain and simple way of writing instead of the elaborate rhetoric of preceding decades, and in modifying word meanings and developing new terms.

This volume is a handsome as well as a valuable recognition of a notable date in the Society's long career. It makes available to the general public through the biographical approach a much needed, readable, and interesting

account of a fascinating aspect of the 17th century, and for the student it provides valuable bibliographies, some with critical comments, as well as suggestions for further work.

Professor Andrade's *Brief History* complements the larger work by describing the Society as it is organized and operates today, using its past history to explain present practices and dwelling upon its activities in the past hundred years. Accordingly, a more accurate title for this sketch would seem to be a *Brief Account*. Charmingly written, with beautiful illustrations (three of them of recent presidents), but without bibliography or footnotes, it is too condensed to be fully adequate even about the Society today. An eminent physicist and an authority on Newton, Professor Andrade has been a Fellow since 1935. One wonders, therefore, if he was among the 10 per cent minority who in 1945 opposed the election of women as Fellows, for he does not mention their eligibility nor their presence, though six were elected in 1945-1947 and others have been since. In the account of Sir Joseph Banks' long presidency Sir Joseph's eminence is emphasized but not the downward slide of the Society in his time nor his opposition to the formation of the specialized scientific societies partly in protest against the lethargy of the Society in his day. Naturally in 28 pages the author cannot tell the full story; but even so this account is too smoothly polished. The general reader will be entertained; the student must investigate further. This, too, is a handsome book, an attractive souvenir of an important milestone in the Society's history.

WILLIAM BEAUMONT. *Experiments and Observations on the Gastric Juice and the Physiology of Digestion.* WILLIAM OSLER. *A Pioneer American Physiologist.* New York, Dover Publications, Inc., 1960. xl, 280 pp. $1.50.

Reviewed by STEWART WOLF, *Professor and Head, Department of Medicine, University of Oklahoma Medical Center, Oklahoma City, Oklahoma.*

THE publisher has performed an important service to medical educators and young physicians of today by making available in an inexpensive paperback edition the classical work of William Beaumont on the stomach of his subject, Alexis St. Martin. The edition is identical to the earlier reproduction commissioned by the American Physiological Society and published in 1929 by the Harvard University Press and distributed to the membership of the Society. The earlier American Physiological Society facsimile is out of print and has long been missed from the book stores. Both facsimiles are prefaced by the appreciative essay on William Beaumont by William Osler, presented before the St. Louis Medical Society in 1902.

When Beaumont's publication first appeared in 1833 it contained the first description in scientific literature of the action of an enzyme, later named 'pepsin' by Theodor Schwann, and finally isolated and crystallized almost a hundred years later by John Northrup, who won the Nobel prize

for his achievement. Beaumont's original monograph also contained the description of his identification of hydrochloric acid as essential to gastric digestion. Although presumably Beaumont was unaware of it, this discovery had already been made two years before by William Prout. A very great contribution of Beaumont's study was to establish early landmarks for psychosomatic medicine. He recognized that the state of St. Martin's stomach depended heavily on St. Martin's psychological relationship with the people and events in his life.

The simplicity of Beaumont's work, its detail and systematic quality, and yet its perceptiveness and resourcefulness mark him as a model for all young investigators today. Anyone remotely interested in medicine can enjoy and profit by this book.

MARIA LUISA BONELLI. *Catalogo dei Globi Antichi Conservati in Italia, Fascicolo 2, I Globi di Vincenzo Coronelli.* With a Preface by Roberto Almagia. Firenze, Istituto e Museo di Storia della Scienza, published by Leo S. Olschki, 1960. 139 pp., 35 illus.

Reviewed by DEREK J. DE SOLLA PRICE, *Professor of the History of Science, Yale University.*

IT is a double pleasure to welcome this volume. In the first place, it is yet another of the scholarly and authoritative publications that we have come to expect from the Institute and Museum of the History of Science in Florence. In the second place, it represents the extension of the highest modern standards of bibliographical description and scholarship to a field outside the normal region of printed books, but yet of great importance to the student. Such an extension of the techniques of bibliography has long been a desideratum for those who work in science museums, and indeed, for the past several years, the project for making an international catalogue of globes has inspired such an extension, not only in Italy but in several other countries, notably in Austria and Great Britain.

The first volume in this series was a monographic treatment of the globes of William Blaeu. The present volume concerns itself with those of Vincenzo Coronelli (1670-1718), who was founder of the Academy of Argonauts, cosmographer to the Venetian Republic, lecturer in geography at Venice, and above all the maker of some of the largest and finest globes ever produced. The total holdings of Coronelli globes in Italy amount to some 68 specimens in 40 different institutions spread over the country. Amongst the specimens there are some 29 pairs of globes (i.e. a terrestrial and a celestial) and of these, some 20 pairs are of the largest variety of 3½ feet in diameter. This edition was published by Coronelli in 1688, and in subsequent editions he put out globes of 1½ feet diameter (in 1696 and in 1699) and of 6 inches (in 1693).

The first result of this new bibliographical survey is that we have for the first time an accurate transcription of the legends on the globes and the

vital facts of their publishing history. The publishing history of globes is perhaps even more complicated than that of books, for not only do there exist several editions and imprints, but the gores themselves may be in their original flat state or mounted in various ways. Slight alterations may be made, even from specimen to specimen. Another point of particular interest is that the mounting of the globe is necessarily individual, and hardly a matter that may be mass-produced, as can the actual printed paper from which the details are recorded. It is especially strikingly to be seen from the many photographs of all extant examples that each mounting has its own individual characteristics, and the variation between specimens of even the same edition in their original mounting is apparently enormous. In particular, the remarkable mounting illustrated in Figure 36 showing one of the 3½-foot globes of 1688 on a type of trestle stand with a horizontal polar axis is unique in this reviewer's experience.

We may be very grateful to the distinguished curator of the Florence Museum, Miss Maria Luisa Bonelli, and to Professor Almagia and the editorial office of Leo S. Olschki, for their part in making available this definitive work.

HAROLD FELDMANN. *Die Geschichtliche Entwicklung der Hoerpruefungsmethoden.* Zwanglose Abhandlungen aus dem Gebiet der Hals-Nasen-Ohren Heilkunde. Heft 5. Stuttgart, Georg Thieme Verlag, 1960. 92 pp., 40 illus.

Reviewed by BRUNO KISCH, *Medical Director and Professor of Philosophy and History of Science, Yeshiva College, New York City.*

THIS is an interesting review of the historical development of methods used to test the hearing of human beings for clinical purposes. The 16th and the 17th centuries have not contributed much to the topic of this monograph which therefore is justly concerned mainly with the contributions of the 19th and 20th centuries. The theory of the successively developed methods and apparatuses is well explained and illustrated with good pictures of the different instruments and some of their inventors, like E. H. Weber, Rinne, Bezold. The field of methodology reviewed is a narrow one, and it might have been very worth while to include, as a supplement, in such a short monograph a history of apparatus to increase the hearing ability of people with normal as well as impaired hearing.

JOHN KOBLER. *The Reluctant Surgeon. A Biography of John Hunter.* Garden City, New York, Doubleday & Company, Inc., 1960. 359 pp. $4.95.

Reviewed by JANE OPPENHEIMER, *Professor of Biology, Bryn Mawr College, Bryn Mawr, Pennsylvania.*

MR. John Kobler, an editor of the *Saturday Evening Post,* has attempted to bring John Hunter to life, as a scientist and as an individual, in a biography

addressed to the general reader. His book has been widely acclaimed in reviews addressed to the general audience. It is ably constructed and, although sometimes uneven stylistically, on the whole well written and easily readable. It is fairly accurate in scientific and medical detail, though there are some errors. But perhaps more important, since this is a biography and not a textbook—how many textbooks would have to be listed to cover the range of Hunter's interests—it does seem to reproduce with reasonable fidelity most of what has been said before about Hunter's life, and much of what has been said about his work.

In fact, if a single word were to be used to describe the book, it would probably be *eclectic*. The reader acquainted with Hunterian literature will find that the author has been scrupulously conscientious in reading the right works (his reference list covers 14 pages) and he has tried to include the findings of as many as possible of the earlier writers. What is already written is the obligatory source for a biography such as Mr. Kobler's. We must ask, then, what has been gained by reassembling it.

The gain, principally, is that it *is* reassembled. For the Hunterian scholar this may be unimportant; for the practising physician, for the medical student, for the neophyte, for the general reader it might be considered to be of some advantage. How considerable the advantage may be depends on what the new author has made of the old material, on how closely he has approached the goal of the biographer to show his man as he really was. What Mr. Kobler has done is tell his readers what earlier writers have told him. He has given a clear picture of what people have said John Hunter was like; and as a result his book lacks immediacy and the fresh breath of life. Perhaps this is inevitable when so much has already been said during almost two centuries, and when so few new sources of insight open up. And perhaps it is enough to have made available within one volume what has hitherto been scattered among so many, and to have translated into more general terms what has been available in more special ones. Perhaps, for the general reader and for the medical student, this may suffice.

But the young are wise, and the medical student who deserves substance as well as its reflection, also deserves direct access to it. If Mr. Kobler has reproduced for them the substance, might he not also have given them, more specifically than in a long list of references, the wherewithal to look more deeply into it? It is hard to believe that abbreviated annotations indicating the sources of direct quotations of the words of Hunter himself would have decreased the value of the book for the general public, and they would have enhanced it for students of Hunter material.

This may be taken as a pedant's prejudice, and perhaps it is. I do not believe that it is pedantic to question the use of the adjective *reluctant* as a key word in the short title. Reluctance was the least salient quality of Hunter's character. If he preferred, as a good surgeon, to avoid cutting

where other means of cure were possible, this makes him not a reluctant surgeon but one of advanced intelligence. His courageous eagerness to *know*, if not to cut, was his most vivid trait, and was responsible for his greatest contribution to surgery, for his establishment of it as a profession founded on scientific knowledge and on scientific principles.

Until the definitive biography that Hunter deserves revivifies him further, Kobler's biography will be read by many physicians and medical students. If it encourages them to return to more direct contemplation of Hunter's work itself (Hunter disliked middlemen), perhaps the rest does not matter.

THEODORE CIANFRANI. *A Short History of Obstetrics and Gynecology.* Springfield, Ill., Charles C Thomas, 1960. 449 pp. $12.50.

Reviewed by JOHN MACLEAN MORRIS, *Associate Professor of Gynecology, Yale University School of Medicine.*

THE current concept of narrow medical specialties, carefully fenced off from each other, is a product of the 20th century. In the previous century birth was attended by men holding titles such as "Professor of Anatomy and Midwifery" or "Professor of Diseases of Women and Children." Nor were obstetrics and gynecology necessarily linked together. The latter was the domain of the surgeon. Even up to 1912 no physician-accoucheur at St. Bartholomew's Hospital was ever permitted to do an abdominal hysterectomy. Thus, a history of obstetrics and gynecology must of necessity be a history of many fields of medicine. It must further cover related aspects of scientific, religious, and political history and encompass the reproductive habits and taboos of various civilizations.

This is all done in a very thorough fashion by Dr. Cianfrani. Commencing with chapters on the customs of primitive people, he passes through Egyptian, Mesopotamian, and Greco-Roman eras with side trips into Chinese, Japanese, Hindu, and Arabian historical developments. Returning to Europe in the Renaissance the author continues through the "Age of Reason" to contemporary obstetrics and gynecology. There are separate chapters on certain aspects of operative gynecology and obstetrics, and on anesthesia, infection, fistulas, and other special facets. The work is comprehensive and encyclopedic. A useful innovation is a section at the end of each chapter entitled "First occurrences and unusual events," which is a tabular summary of the period under discussion.

The encyclopedic nature of this work, however, is perhaps its defect. It does not approach Harvey Graham's *Eternal Eve* in human interest and readability. Too much emphasis is placed on tabulating "firsts," six or eight frequently being recorded on a single page. Claims for priority are notoriously debatable and in many instances are perhaps an unimportant aspect of medical history. Even within this volume there are conflicts, more

than one individual being given credit for the same "first," e.g. William Hunter is credited with being the first to describe the round ligaments, whereas elsewhere van Horne is given the same distinction. The organization of the book leads to some repetition, and in some places illustrations are unrelated to the text.

With his roots in Philadelphia it is natural that Dr. Cianfrani should place considerable emphasis on that city's justifiable claim to medical fame. It is unfortunate, however, that he does so at the expense of other areas. For example, almost equal space is given to the arguments against anesthesia made by Charles Meigs and to Simpson's discovery of chloroform. The former, once termed by the late Frederick Irving as "a barnacle upon the ship of progress," deserves scant mention in history in spite of his eminent position as professor. Furthermore, it seems hardly fair to give credit to local methods of treating cervical cancer, while dismissing or failing to mention Taussig, Schauta, Brunschwig, Bonney, Reygaud, Coutard, Forsell, Heyman, and others.

While some contributors to such special fields as pelvimetry, oncology, endocrinology, genetics, fetal development, and other facets of the modern specialty are overlooked, the fault of the book, if any, is that too many rather than too few names are included. This makes it useful for reference, but tabulations of names and dates are less interesting for the reader than the anecdotes, description of customs of the times, and excerpts from contemporary writing. While not exactly the "fascinating reading" described on the dust jacket, the book is a brief but thorough and worthwhile compilation of many of the basic discoveries in the field.

JOSEPH NEEDHAM, WANG LING and DEREK J. DE SOLLA PRICE. *Heavenly Clockwork. (The Great Astronomical Clocks of Medieval China—A Missing Link in Horological History.)* Cambridge, Published in association with the Antiquarian Horological Society at the Cambridge University Press, 1960. xv, 254 pp., 71 illus., $12.50.

Reviewed by SILVIO A. BEDINI, *Ridgefield, Conn.*

HISTORIANS have attributed many inventions and discoveries to the Chinese, often with justification. Now, within the past several years, another invention of the greatest significance to the history of science has been brought to light by Professor Joseph Needham of the University of Cambridge.

Working with two distinguished collaborators, Dr. Wang Ling and Dr. Derek J. de Solla Price, Dr. Needham uncovered valuable data revealing the production of astronomical clocks and armillary spheres in China over a period of 1500 years between 100 and 1600 A.D.

Dr. Needham's initial discovery was an account written in Chinese in A.D. 1090 by Su Sung on the subject of a "New Design for a Mechanized Armillary Sphere and Celestial Globe." The account described a great

astronomical clock tower constructed of wood more than 30 feet in height. Water-powered globes and jacks rotated automatically at the pinnacle, while other automata indicated the time visibly and audibly outside the tower. The time-keeping device was operated by a water-wheel escapement contained within the structure. This consisted of a number of troughs into which water poured successively and continuously. As each trough filled, it tipped a weightbridge causing the water-wheel to turn and then was brought to rest by a detent which permitted the next trough to fill. A period of 15 minutes was required for the filling and emptying of each trough.

The discovery of Su Sung's text was only the starting point for the research team. The numerous technical terms in the text had to be interpreted and then proven. Once the vocabulary was established, they were enabled to proceed with the translation and interpretation of earlier Chinese texts on related subjects.

The results were most rewarding. From these earlier writings Dr. Needham and his associates learned that the Su Sung clock was in actuality not the first astronomical timekeeper, but the culmination of a series of them. The first one was apparently pioneered in the second century A.D. by none other than Chang Hêng (A.D. 78-c.142), who was already on record as the inventor of the seismograph. The clock of Chang Hêng was an armillary sphere which was rotated by the force of flowing water, presumably by a water-wheel with scoops. On the basis of their study of these earlier texts, the authors attribute the first water clock with an escapement of the Su Sung type to have been the invention of a Tantric Buddhist monk named I-Hsing about A.D. 725.

From Su Sung the authors went on to study the succeeding period. They found records of a continuous development of Chinese clockwork applied to rotation of the armillary sphere rather than for the indication of time. The documentation bears out a theory previously proposed by Dr. Price, namely, that the mechanical clock per se was not independently invented as a time-keeper but was an incidental development from elaborate clockwork mechanisms designed specifically for the operation of globes and orreries.

The next important milestone in the history of Chinese science and horology was marked by the arrival of Jesuit missionaries in China in 1583, who brought with them clocks produced in the clockmaking tradition of the Western World. The mechanical striking clocks which the missionaries introduced proved to be of considerable interest to the Chinese and greatly enhanced the prestige of the missionaries. Because the word "clock" was directly translated into the Chinese term for "self-sounding bells," the majority of Chinese scholars derived an impression that the European mechanical clock was an ingenious new invention quite distinct from the

Chinese astronomical instruments. This impression was augmented by the missionaries themselves, who maintained no modest opinion of the superiority of European intelligence. One of the most important consequences was a clock, which combined Occidental and Oriental concepts, constructed by Wang Cheng and Johann Schreck, a missionary, in 1627. Wang described his "Wheel Clepsydra" as follows:

> . . . There is a cross-shaped [device] having two hitting teeth [i.e. pallets] to left and right. All the wheels [of the gear train], impelled by the motion transmitted through them, would move quite fast, if it were not for the hitting teeth [pallets] in the centre, which slow down the movements, seeming to be pushed to the left yet arresting on the right. This is a very delicate piece of machinery, and the very essence of the 'Wheel Clepsydra'. . . .

The mechanism contained a European movement indicating equal double-hour time in front, and a scoop wheel marking the night watches in the rear.

The epoch of the Jesuits in China with their "self-sounding bells" marked the first step in the unification of world science in eastern Asia and a mutual understanding of the cultures of the East and the West. An inevitable result of the interest aroused by the European clocks introduced by the missionaries into China was the development of commerce in timepieces, which continued into the early 19th century.

The authors examined the records of the missionaries for references to timekeeping methods developed subsequent to their arrival, and a whole tradition of sand-driven wheel clocks dating from the end of the 14th century came to light. They also found that the stationary dial with rotating index existed in China before the end of the 14th century, probably as an independent invention, at approximately the same time that it appeared in Europe.

Special sections of this comprehensive work are devoted to the Hellenistic background of horology, a general history of astronomical clocks and their transmission as well as a brief summary of European horology in the 13th and 14th centuries.

Heavenly Clockwork is a most impressive, scholarly study, presented in a well-ordered fashion. Because of its great wealth of material concisely presented, and the exhaustive supplementary data and explanation which are provided, it may prove a difficult book to read from cover to cover. A reader will find himself impelled to return again and again to re-examine one section or another. This work is one of the most important pieces of research in the history of science and technology to be published in many years, and one that will assume increasing significance with the passage of time. The book is set in a most legible type on fine paper with many excellent plates and text illustrations and is beautifully bound.

JEROME M. SCHENCK. *A History of Psychiatry,* Springfield, Ill., Charles C Thomas, 1960. lx, 196 pp., 4 illus. $5.50.

Reviewed by LAWRENCE C. MCHENRY, JR., Capt. (MC), *Walter Reed Army Institute of Research, Washington, D. C.*

DR. Schneck's book was written primarily for students and the clinician. In his preface he states that he would like it to enhance the perspective of undergraduates and to furnish a compact, up-to-date, readable volume for young physicians in their intensive postgraduate studies. As a work written for practising psychiatrists, psychologists, and social workers, as well as students, the author has adequately handled his task. As an historical work per se, however, it falls far short of the mark.

The book, following a chronological sequence, is divided into 12 chapters, the last 7, nearly two-thirds of the book, being devoted to the 18th, 19th, and 20th centuries. In general the book mentions almost all facets of the history of psychiatry, with emphasis on biographical material rather than on the development of psychiatric theory. This is probably a laudable characteristic since the book was written for those not historically oriented. Of note is the author's inclusion of material from historical articles in current psychiatric and medical historical journals.

The main weakness of this work is that, in many places, it is difficult to read because the author's presentation is vague. This lack of clarity becomes apparent in the first chapter and continues through the entire book. On page 3:

> Sir James Frazer described the Law of Similarity and the Law of Contact or Contagion (4). Like produces like, hence an effect resembles its cause. Things once in contact continue to interact even at a distance after contact has been severed. Charms relating to the Law of Similarity are part of Homeopathic or Imitative Magic. When related to the Law of Contact they are Contagious Magic.

In addition to such confusing sections, the author often will insert irrelevant material thereby diverting the reader's attention from the original theme. Frequent clichés give the work a pedestrian character.

Schneck acknowledges that he is much indebted to the writings of others in the development of his work, but it is unfortunate that he did not use passages in their entirety in quotes, since his own shortened versions frequently distort the original meaning. For example, in referring to Stahl he takes the following from Lewis, *A Short History of Psychiatric Achievement,* page 71:

> He formulated a complete theoretical system of animism which opposed materialism and which can be recognized in many of the psychiatric ideas of the eighteenth century. This vitalistic theory included man only, the lower animals still being subject to the mechanical forces. In his philosophy, mental disorder represented the effort of the sane to escape untoward influences. The soul has a role similar to the Archaeus of Paracelsus. Life

is motion which is, in turn, due to the soul; therefore, all diseases are rather disorders of the soul than of the body.

In Schneck's book, page 51, this becomes:

The animistic concepts in opposition to materialism influenced eighteenth century psychiatric thinking (5). Vitalism pertained to man. Mechanistic forces operated in lower animals. The effort to ward off deleterious influence may lead to mental illness. The soul bears similarity to the Archaeus of Paracelsus, and life is motion stemming from the soul. Diseases are disorders of the soul (5).

Any historical work taken from secondary sources is liable not only to incorporate the direct errors of the original author, but also to add errors in interpretation of the original. One such error in this work, on page 78, is the statement that Cullen wrote a work, *Institutions of Medicine.* Cullen wrote *First Lines of the Practice of Physic,* which Pinel translated into French giving as the title, *Institutions de Médecine-Pratique.*

One cannot help but compare Schneck's work with Ackerknecht's *Short History of Psychiatry,* and Bromberg's *The Mind of Man.* In these works, especially the latter, a clearer and more concise picture of the backgrounds of psychiatry can be obtained. The cost of Schneck's work, in comparison to the above, will be another factor deterring a prospective buyer. An author and subject index are included.

DEBORAH MACLURG JENSEN. *History and Trends of Professional Nursing.* St. Louis, The C. V. Mosby Company, 1959. x, 594 pp. $5.25.

Reviewed by ERNESTINE WIEDENBACH, *Associate Professor of Obstetric Nursing, Yale University School of Nursing.*

WRITTEN specifically for pre-nursing or nursing students, this book presents the history and trends of professional nursing as they relate to major social movements throughout the world, medical progress, and the growth and development of hospitals. At times the material is presented impersonally; at times, addressed directly to the student reader.

The book traces nursing's historical background from ancient times through World War II. The effect on nursing of such social upheavals as the Renaissance, the Reformation, the Industrial Revolution, and the emancipation of women is described in detail. Described also is the development of the care of the sick and wounded from an expedient for dealing with an unpleasant aspect of life to compassionate service to the afflicted, and finally to modern scientific methods of cure of dysfunction and deformity resulting from disease. The emergence and growth of professional nursing organizations and their influence on standards of nursing are also included. The organizational and legal aspects of nursing are presented along with brief sketches of the development of nursing, nursing education, and the status of the nurse in other countries, among these the British Commonwealth, Asia and Asia Minor, Central and South America.

Appended to each unit is a list of study questions and projects nursing students may want to pursue, as well as a comprehensive list of references.

All in all, the book is broad in scope and contains a vast amount of information about nursing. Somehow, however, in telling the story of nursing's struggle to develop its organizational structure and achieve professional status, the humanitarian services which nurses render and which are the true basis of their professional stature are for the most part overlooked. Nevertheless, the book may serve a useful purpose through its compilation of historical and contemporary data about organized nursing and the lists of selected references.

C. N. B. CAMAC. *Classics of Medicine and Surgery.* New York, Dover Publications, Inc., 1960. x, 435 pp. $2.25.

Reviewed by WARNER L. WELLS, *Associate Professor of Surgery, The University of North Carolina, Chapel Hill, North Carolina.*

THE republication of Camac's *Epoch-making Contributions to Medicine, Surgery and the Allied Sciences,* first issued by W. B. Saunders in 1909, provides the student with ready and inexpensive access to eight of the classic papers in medical discovery. Included are the complete and unabridged texts of: Lister's "Antiseptic Principle of the Practice of Surgery," Harvey's "Motion of the Heart and Blood," Auenbrugger's "Percussion of the Chest," Laennec's "Auscultation and the Stethoscope," Jenner's "Inquiry into Smallpox Vaccine; Further Observations; Continuation of Observations," Morton's "Administering Sulphuric Ether; Physiology of Ether," Simpson's "A New Anaesthetic Agent," and Holmes's "Contagiousness of Puerperal Fever." There are biographical sketches for each author.

There is value in having these papers together, to be read in sequence, to discover again the common denominator of genius. Simplicity, the quest for truth, humility, modesty, and a willingness to endure rebuff, calumny, and worst of all, indifference bind these classics into a unity not apparent when they are read separately. The value of accurate observation is reaffirmed, as is the use of the five senses in the study of nature. Moreover, the lucid, logical writing will provoke the admiration of any student seeking excellence in his own mode of expression.

These authors are never better than when hot on the trail of their principal discoveries, and their feet of clay only show through to us ordinary people when they wander afield into the smoky realm of conjecture, extrapolation, and prolixity. When they do "good," they do so in the grand manner.

I wish this neat little volume could be owned and read by every medical student. There could be no better way to confront him with the fact that discoveries are made by people, and that all we know in science has sprung from resolute and stalwart minds, most often with the minimum of props or gadgetry.

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WILLIAM OSLER MEDAL CONTEST

The William Osler Medal, first awarded in 1942, was established by the American Association for the History of Medicine to help perpetuate one of the most valued services of Sir William Osler (1849-1919), that of stimulating the interest of physicians and medical students in the history of their chosen profession.

Rules of the Contest

The contest is open to all undergraduate students in the medical schools of the United States and Canada. An essay written while the student was an undergraduate may be submitted in the annual contest in force at the time of his graduation. Essays that have been submitted previously in this contest are eligible, provided that they have not won the Osler Medal or Honorable Mention. Winners of these awards may submit a different essay.

An assay, when submitted, should be accompanied by (a) a statement by an administrative officer of the medical school testifying to the student's undergraduate status at the time the essay was written; (b) a statement by the student that his essay has not been published in whole or in part.

Essays:

(a) should be fundamentally the work of the student contestants. It is anticipated that they will seek guidance from faculty advisors, and make use of sources open to all investigators, such as libraries and museums;

(b) should embody some original research, or demonstrate an uncommon approach to a recognized medico-historical problem;

(c) should not exceed 10,000 words;

(d) are subject to acceptance for publication in the *Bulletin of the History of Medicine*, the official organ of the Association, if awarded the Osler Medal or Honorable Mention.

TERMINAL DATE OF THE CONTEST: 15 APRIL, 1961

SANFORD V. LARKEY, M.D.
RALPH H. MAJOR, M.D.
W. B. MCDANIEL, 2D, Ph.D.
Chairman

Essays and inquiries should be addressed to the *Chairman* at the College of Physicians of Philadelphia, 19 S. 22d Street, Philadelphia 3, Pennsylvania.

Naval Medicine in the Early Days of the Republic*

LOUIS H. RODDIS**

THE time between the surrender of Cornwallis in 1781 until the beginning of the first administration of Washington as President in 1789 has well been called the critical period of American history. The newly liberated colonies faced many serious problems. The union of the States under the Articles of Confederation, the making and adoption of the Constitution, and the election of the first President occurred in this period. In Washington's first and second administrations there arose the difficulties of collecting the taxes and such episodes consequent to it as the Whiskey Rebellion, trouble with the Indians on the frontiers, treaties of amity and commerce with the various nations of the world, and the struggle between the individual rights of the new states and the still newer Federal authority. Heavy debts rested on the country, and the responsibility of caring for the crippled veterans left by the Revolution had to be assumed by the recently established government. The British held some of the border forts, and Washington could not press too hard to force them out as the States also had not fulfilled certain commitments made by the treaty with Great Britain.

The new nation consisted only of the 13 colonies along the Atlantic coast and a few scattered settlements west of the Alleghenies. The total population at the first census in 1790 was 3,929,214. By 1800 the population had risen to 5,308,483, an increase of 35 per cent in ten years. On the first date about 100,000 were west of the Allegheny Mountains; on the latter date there were about four times that number in the western settlements in the Northwest Territory, Kentucky, and Tennessee. There were only five cities of any size, Boston, New York, Philadelphia, Baltimore, and Charleston, indicating the predominance of the rural populations. There were a considerable number of Negro slaves, a good many in the northern colonies. There were only five daily papers, and 75 postoffices. The first state permitted to join the original 13 colonies was Vermont in 1791, followed by Kentucky in

* This article is a chapter from the author's uncompleted book "The History of the Medical Department and the Lives of the Surgeons General of the United States Navy."

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1792. Tennessee was admitted in 1796, so that by the end of Washington's administration there were 16 states in the new republic.

Despite the handicaps of debt and the difficulties of organizing the Federal government and beginning its operation, recovery from the effects of the war was rapid. Agriculture, business, and commerce prospered and expanded. It was the necessity of naval protection for our merchant ships that led to the foundation of the regular navy of the new republic.

The trade with the Orient became world-famous. Ships loaded with goods for the Indian trade such as trinkets, bright brass or tin utensils, prints, beads, and hardware went to the Northwest Coast, as the present area of the states of Washington, Oregon, and the province of British Columbia was called. There these "trade goods" were exchanged for furs, particularly the beautiful fur of the sea otter, though beaver, mink, bear, and other furs were extensively bought. When laden, the ship sailed for China, usually Canton. Here the furs were sold at a large profit (estimated at 700 to 1,000 per cent) and replaced by a cargo of tea, silk, china, lacquerware, hammered silver and brass, and carved ivory ornaments as the principal items. The East Indian trade to Calcutta and Bombay brought back spices, cotton cloth, and jute. The pepper trade with Sumatra also came to be a source of wealth to these New England seamen. There was an extensive commerce with the Mediterranean countries and the Near East in dried figs, raisins, Turkey carpets, tragacanth, myrrh, opium, oranges, lemons, cork, olive oil, and wine. Salt was another commodity on almost every New England-bound cargo, for there was a great fishing industry there, and the codfish became one of the sources of national wealth. The whaling fleet was another maritime venture that paid well and carried New England ships and men to the Arctic and Antarctic and the waters of the North and South Pacific. Cleveland, in his *Voyages of a Merchant Navigator,* says, "Salem ships led fhe way round the Cape of Good Hope to the Isle of France, India, and China. They were the first to display the American flag and open trade at Calcutta, Bombay, Sumatra, Zanzibar, Madagascar, Australia, Batavia, Mocha, and St. Petersburg."

In 1785 the last of the vessels of the Continental Navy had been sold and the country was left without a single naval vessel. All of the states except Delaware and New Jersey had maintained state navies, but these had ceased to exist with the single exception of Virginia which still maintained a couple of small armed vessels.

Incidentally, the Army was in as nearly a depleted condition. The total strength in 1784 was 80 privates and the highest rank in the Army was that of Captain. It was trouble with the Indians along the northwestern frontier which resulted in the creation of the first regiments of the Regular Army. It was interference with our commerce by the so-called Barbary States, Algiers, Tunis, and Morocco along the Mediterranean coast of Africa, and trouble with our former ally, France, that led to the beginnings of our Regular Navy and the establishment of a Navy Department. Merchant ships were captured by corsair vessels of these Barbary States and the crews reduced to slavery. This had been going on with the ships of European countries as well, and a regular business of ransom had grown up. At times punitive expeditions had been sent against them by England, France, Spain, and Portugal, but no decisive results had been obtained, principally because the various European nations had no concerted policy on the matter except that of tribute and ransom. We began with this same policy and sent tribute as "protection money." This was usually taken and then, on such pretexts as that it was not a sufficient amount or not paid on time, our ships were captured or plundered, and crews enslaved as before. Public indignation in the United States mounted, and on 27 March 1794 Congress authorized the building of six frigates and recruitment of personnel to man them when completed. These frigates are all famous in naval history. They were the *Constitution, United States, President, Chesapeake, Constellation,* and *Congress.* Among the officers authorized were Surgeons and Surgeons' Mates ". . . who shall be appointed and commissioned as other officers of the United States are." It provided that there should be one Surgeon and two Surgeon's Mates for each ship of 44 guns and one Surgeon and one Surgeon's Mate for each ship of 32 guns. The pay was $50.00 a month and two rations for a Surgeon and $30.00 a month and two rations for a Surgeon's Mate. Of the six frigates, the *Constellation, Constitution,* and *United States* were the first completed. They were commissioned in 1797. Additional vessels were built or bought, and by the end of 1798 there were 23 vessels in the Navy, eight of which were revenue cutters.

A most important step was the creation in 1798 of the Navy Department. When Washington assumed office in 1789, he appointed only four Cabinet officers. The original government departments, the dates of their creation, and the first to hold them are as follows:

Department	*Established*	*First to Hold Office*
Department of Foreign Affairs (Name changed to Department of State 15 September 1797)	27 July 1789	Thomas Jefferson
Department of War	7 August 1789	Henry Knox
Department of the Treasury	2 September 1789	Alexander Hamilton
Attorney General	22 September 1789	Edmund Randolph

Congress, on 22 September 1789, provided for a Postmaster General, but he was not raised to Cabinet rank until more than 40 years later. Jefferson and Randolph were from Virginia, as was President Washington. Knox was from Massachusetts, and Hamilton from New York.

President Washington, in a message to Congress on 7 December 1796, stated that "To an active external commerce the protection of a naval force is indispensable," and he continued to urge the foundation of a proper naval establishment so that ". . . a future war with Europe may not find our commerce in the same unprotected state in which it was found by the present." In 1798 the value of exports and imports of the new country was nearly $125,000,000. The cost of building, arming, and maintaining the new ships from 1794 to 1798 was only $2,510,730.69. It was estimated that the savings to merchants was over eight and a half million dollars in marine insurance.

Maritime affairs had been part of the War Department, but the building, equipment, and operation of our ships called for special knowledge and interest, and the necessity for a government department to oversee naval affairs began to be more fully realized. Consequently, a Department of the Navy was created by an Act of Congress on 30 April 1798. The first Secretary of the Navy was Benjamin Stoddert of Georgetown, D. C., who was nominated on 21 May 1798. The offices of the Navy Department were in Philadelphia and were moved to Washington in June, 1800.

The first of the new frigates completed and commissioned was the *Constellation,* which may be considered as the first major vessel of our Navy. She was commanded by Captain Thomas Truxtun, who was to become one of the most distinguished naval officers of the time.

The first Surgeon appointed in the new Navy was George Balfour of Virginia. He was appointed to the *Constellation* on 9 March 1798, and thus is the senior of all medical officers of the

regular Navy of the United States. The name of the loblolly boy on the *Constellation* is also known; he is the first representative of the Hospital Corps. The Medical Department of the *Constellation,* from the available records, consisted of: Surgeon, George Balfour; Surgeon's Mate, John Murdough; Surgeon's Mate, Isaac Henry; Loblolly Boy, John Wall.

Although our Navy was begun as a result of the threats to our commerce from various Barbary States, it was our old ally in the American Revolution, France, with whom we first fought. This was due to the overthrow of the French monarchy and subsequent indignation in France that the new republic of the west did not join then in hostility to England nor approve of the excesses of the radical French leaders. Attacks on our commerce followed, and from 1798 to 1800 we were engaged in what has been called the Quasi-War with France. This was limited to naval encounters only, but some of them were among the severest engagements in which our navy has engaged. It was the *Constellation* which took the most important part in the war with the capture of the French Frigate *Insurgente* on 9 February 1799, and a severe action with the French Frigate *Vengeance* on 1 February 1800. The *Vengeance* was soundly defeated but succeeded in making her escape due to injuries to the masts, sails, and rigging of the *Constellation.* In a somewhat excited letter to his father shortly after the latter engagement, Surgeon Isaac Henry tells of this battle:

1-2 February 1800

To Hugh Henry, Philadelphia, Pa., from Surgeon Isaac Henry, U.S. Navy
US. Ship *Constellation* 3d February 1800 –

MY DEAR SIR – On the 1st Inst. off Guadaloupe, (about 7 oClock in the morning) – we fell in with a large Sail (*La Vengeance*) – which bore ahead about 2 leagues – we made sail and gave chase – she made sail & stood from us – about 8oClock in the Evening – we got within gun shot – when she fired a stern chase at us – we continued the chase – she firing continually her stern chases – without a shot from us until we got close along side – when a general action commenced – which continued incessantly for five Hours – unfortunately at the expiration of that time our Mainmast was shot away – our Mizen Topmast had gone early in the action just above the cap – she was running away from us when our Mainmast went – which prevented our following her – we are now Sir the most perfect wreck you ever Saw – scarcely any thing standing – we tore her all to pieces – but the Rascalls fought like cowards in firing at our Rigging to get away – now I have gone so far I will let you know her force – 58 Guns, and heavier metal than ours & suppose full of Men – My Dear Sir if we could have kept our Mainmast she would have been ours – We are now within 48 hours sail of Jamaica – and making the best of our way there – we fortunately met with the Conveyance by which you get this – a few hours since –

We have had 15 killed & 25 wounded; and, all badly
I write this in great hurry — Give my love to all
I am Dr. Sir — ever

Your affe. Son
ISAAC HENRY

PS. Tom is well & fought like a Brave fellow.

The casualty list submitted by Dr. Henry is also quoted in full as an example of the type of such report used in our early navy:

List of officers and men killed, wounded, and missing
in U. S. Frigate *Constellation:*

(1-2 February 1800)

Killed

Seamen—William Lightfoot, John Willson,
John Robinson, James Foster,
John Smith, Emanuel Manna,
Thomas Stevenson, Robert Smile, (?)
John Williams, Emanuel Deist,
William Powell
Marine—Christopher McCormick
Boy —Joseph Graves

Wounded

A. Shirley, 2d lieut. slight wound in the leg;
Mr. Wederstrand, midshipman, slight wound on the head;
Mr. Warren, midshipman, do. do. —
Mr. Comerford, master's mate, do. —
John Highland, quarter gunner, do. in the back;
James Rodgers, sergeant of marines, do. on the arm;
Jonathan Bell, sail maker's mate, fractured leg—
Seamen—Soho Hurst, arm shot off and wounded in the side;
Thomas Clarke, fractured leg;
William Musgrove, fractured thigh;
James Carter, slight wound in the thigh, and side;
Ephraim Jabins, slight wound in the arm;
Benjamin Cradford, arm shot off—dead;
Antonio Payntz (?), slight wound on the head;
Edward Hollman, slight wound in the arm and knee;
George Matthews, fractured thigh;
John Logan, fractured leg;
Thomas Fitzgerald, wounded on the gluteous muscle;
Charles Lewis, shot through the arm;
William Howell, slight wound in the thigh.
Marines—Cacie Branton, wound in the thigh;
William Small, shot through the thigh;
Geo. Carson (?), shot through the hand,
Boys —John Baptist, leg shot off;
Phillip Smith, wound in the back of the neck.

Missing

Mr. James Jarvis, midshipman.

ISAAC HENRY, Surgeon.

The *Constellation* went into Port Royal, Jamaica, to refit, where they were kindly received, and where they transferred nine of their seriously wounded. The list of these with the type of wound and disposition is preserved and is as follows. It will be noted that three of the nine died, a mortality rate of 33 1/3 per cent among severely wounded. Modern aseptic surgery, tetanus inoculation, plasma, and penicillin might have saved these and brought the rate to that of World War II, which ranged from 2 to 4 per cent:

The advent of Napoleon into power ended the undeclared war with France by the beginning of 1801. By this time, however, we were on the verge of war with the Barbary States. When Congress authorized the building of six frigates for our Navy in 1794, it stipulated that if a treaty should be concluded with the Barbary States, work in the building of the six frigates should be stopped. In 1795 a treaty was concluded with Algiers of a most disgraceful character. We were to pay for the ransom of all captured American seamen, give an annual gift of naval stores to the value of $21,000 to the Dey, give substantial presents with the appointment of each new Consul, and build and give the Dey a new frigate. It is estimated that this treaty cost well over $1,500,000 for ransoms and gifts alone, a large amount for the finances of the young republic to bear. In addition, this appeasement policy probably lengthened the war which was certain to come and so caused further expense. This war was hastened by the demand of Tunis and Tripoli, both of whom were jealous of the concessions secured by Algiers, and it was necessary to bribe them as well to prevent depredations on American commerce.

As the treaty with Algiers had been signed, work on the six frigates was stopped in 1796, and it was only on the insistence of President Washington that work on three of them was resumed and the *Constellation, Congress,* and *Constitution* completed in 1798. As the demands of Tunis and Tripoli became more outrageous, the Algerians also asked for an increase of the tribute to them. Finally on 10 May, 1801, Tripoli formally declared war on us, the first foreign power formally to declare war on the United States, for the war with France had been limited to sporadic engagements without an official declaration by either government.

Surgeon Jonathan Cowdery of the U. S. frigate *Philadelphia* was one of those who shared with the crew of that ship experiences as a prisoner of war as harrowing as some of those from the prison

List of men sent to the hospital at Port Royal from the U. S. Frigate *Constellation,* Captain Thomas Truxtun U. S. Navy, after action with French Frigate *La Vengeance,* 1-2 February 1800

Name	Rank	Wound and Where	Time Sent	Died	Remaining
Jonathan Bell	Sail M. Mate	Amputated thigh	12th Feby. 1800	17th Feby. 1800	
John Hoxse	Seaman	Amputated arm	12th Feby. 1800	——	26th Feby. 1800
Thomas Clark	Seaman	Amputated leg	12th Feby. 1800	——	26th Feby. 1800
George Matthews	Ordinary Sea	Fractured thigh	12th Feby. 1800	22 Feby. 1800	
Charles Lewis	Boy	Shot thro' the arm	12th Feby. 1800	——	26th Feby. 1800
Philip Smith	Boy	Shot thro' the neck	12th Feby. 1800	24 Feby. 1800	
John Baptist	Boy	Amputated leg	12th Feby. 1800	——	26th Feby. 1800
John Carson	Marine	Shot thro' the hand	12th Feby. 1800	——	26th Feby. 1800
William Small	Marine	Wound thro' the thigh	12th Feby. 1800	——	26th Feby. 1800

(Signed) ISAAC HENRY, Surgeon

camps of World War II. The frigate *Philadelphia,* while blockading the harbor of Tripoli, ran aground on 31 October 1803 as she was chasing a ship inshore. Unfortunately, she was the only American vessel present at the time and, being helpless, was captured and her crew taken prisoners. Dr. Cowdery, the Surgeon, kept a journal throughout the period of their captivity which lasted until 6 June 1805, a period of 19 months. The condition of the prisoners was hard. The men were employed on all sorts of work, the food was poor, and they were beaten, abused, and threatened. However, Captain Bainbridge established a credit with the Danish consul, and arranged to supply food, clothing, and mattresses. There was an abundance of fruit, pomegranates, dates, and oranges. Dr. Cowdery of course cared for the sick of the ship who were placed in a small house near the palace. His skill and attention led to the Bashaw sending for him to prescribe for himself and two officers of his body guard. The next day the patients were much better, and Dr. Cowdery ". . . was received and treated very politely." He also treated the Turkish ambassador and a little later the Bashaw's 11-month-old child who was dangerously ill. The recovery of the child following Dr. Cowdery's attention led the Bashaw virtually to install him as the family physician, and he attended the Bashaw's wife in her confinement and in an illness of his eldest son who was called the Bey. Dr. Cowdery was given lodgings in the palace and indeed came to have a great amount of influence which he used to ameliorate the condition of the other prisoners and assisted Captain Bainbridge in many ways towards this same end. When the war ended, the Bashaw parted with Dr. Cowdery with the greatest regret. He was desirous of having him remain and once said he would not take $20,000 for him, though the price of an ordinary prisoner was only $50. Cowdery afterward published a small book recounting in an entertaining manner his experiences during this captivity. Reading it, one is struck by the similarity in experiences to that of many prisoners in World War II and how hard and heartbreaking is the lot of the prisoner of war and how much misery has been endured by prisoners of war in all times.

The grounding and capture of the *Philadelphia* led to what Lord Nelson, certainly an excellent judge of valor, called "the most daring act of the age." In order to prevent the Tripolitans refloating and repairing this American frigate and using it against our squadron, a plan to board and burn the *Philadelphia* was approved.

A ketch, the *Mastico,* that had been captured from the Tripolitans and appropriately renamed the *Intrepid,* was loaded with incendiaries and manned with volunteers under the command of Lieutenant Stephen Decatur. She entered the harbor of Tripoli on the night of 16 February 1804, and under the guise of a coasting vessel which had lost her anchors in a recent storm gained the side of the *Philadelphia* unsuspected. The frigate was boarded and the crew overpowered, the combustibles from the ketch were brought up, and the frigate set on fire fore and aft, after which the well-named *Intrepid* made her escape under a heavy fire without the loss of a man.

This little ship, the *Intrepid,* has a place in naval medical annals as she was apparently the first vessel of our navy to be designated as a hospital ship. The squadron in the Mediterranean was at the time under the command of Commodore Edward Preble. On 23 October 1803, Commodore Preble asked the Navy Department for a store and hospital ship. As none was provided and as he had many sick in the squadron, he wrote: ". . . directed the ketch *Intrepid* to be fitted out as a Hospital Ship, to receive the sick from *The Enterprize,* the crew of that Vessel being unhealthy, in consequence of the time of service of that Vessels Crew having long since expired I ordered twelve of the Crew to be discharged, who insisted on being released, the remainder were prevailed on to remain a few weeks longer . . ." In his personal diary dated 9 July 1804, the Commodore wrote: ". . . at 8 A M anchored in Syracuse Harbor with the *Nautilus* & Bombs in company found here in safety the *Enterprize,* six gun Boats with the Ketch *Intrepid* which I have converted into an hospital ship for the sick . .."

Commodore Preble should also be remembered by the Medical Department for he obtained from the Secretary of the Navy instructions that were dated 13 July 1803 authorizing him to establish a naval hospital at Syracuse, Malta, or some other suitable place in the Mediterranean. This was at the time the *U.S.S. Constitution* was being fitted out as the flagship of the Mediterranean squadron. This hospital, afterwards established at Syracuse, was undoubtedly the first naval base hospital overseas placed in operation by the U. S. Navy. The hospital itself was established at Syracuse, Sicily, on 10 November 1804 by Dr. Edward Cutbush, on the order of Commodore John Rodgers who had succeeded Commodore Preble in command of the squadron in the Mediterranean. Previously, the British military hospitals at Gibraltar and Malta had been util-

ized to some extent in caring for the sick and wounded. Gibraltar and Malta had also been used as a base for supplies and finally Syracuse, an island off Sicily.

Edward Cutbush was one of the most notable of our earlier medical officers, a pioneer in many ways. He was the first to establish and command a naval hospital, also the first medical officer to serve as fleet surgeon, for he served in that capacity in 1803 and 1804 with Commodore John Rodgers. Cutbush was the author in 1808 of the first American book on naval medicine, his *Observations on the Means of Preserving the Health of Soldiers and Sailors.* He is also the first naval surgeon who is positively connected with the use of smallpox vaccination in our navy.

Cutbush left an interesting journal, and there are a number of his letters extant. From these, Captain F. L. Pleadwell, Medical Corps, United States Navy, wrote an excellent account of his life and work. Cutbush was born in Philadelphia in 1772 and received his medical training at Philadelphia Hospital where he served four years when the "Managers, Physicians, and Surgeons" of that institution certified that: "We think [he] is become well qualified to take charge of the Health of his fellow Citizens as a Physician and Surgeon."

He was a highly successful hospital administrator, as well as a most capable surgeon, and made friends with many Sicilian physicians and prominent local residents of the island. He studied Italian and came to read and speak it fluently. Washington Irving, then a young man and not yet famous, was traveling in Europe and spent some time in Syracuse where he went about with the officers of the American squadron. Among Cutbush's patients was General William Eaton, former Consul at Tunis, who had engineered an attempt to overthrow the ruler of Tripoli by starting a revolution in favor of Hamet Caromalli, the brother of the reigning pascha. Eaton, with Hamet, and about a dozen Americans led a native army reinforced by a few United States Marines from Alexandria, Egypt, along the shore of the eastern Mediterranean, following approximately the route fought over by the Italians, Germans, and British in World War II, and captured Derne, but here were driven out. General Eaton, Hamet, and wounded from his miscellaneous army were cared for by Cutbush in the newly established naval hospital at Syracuse.

This hospital was broken up in May 1806, since the Barbary War was over and the American naval forces in the Mediterranean

were greatly reduced. Dr. Cutbush was returned to the United States on the frigate *Essex*. He had done a splendid piece of work, and Rodgers and others recommended him for the post of Consul at either Tunis or Tripoli. He was not, however, appointed.

Cutbush was probably the first in our navy to recommend a uniform for enlisted men. He was almost certainly the first to give detailed and concrete specifications for such a uniform and to plan a "summer and winter uniform." He also recommended that the band around the cap or hat display the name of the ship and N. U. S. (Navy of the United States), a suggestion that was undoubtedly the origin of the flat hat of our navy with ribbon band and the name of the ship and U.S.N. on it in gold. Cutbush also gave specifications for a button with an eagle and anchor, and recommended the pea jacket as a necessary part of a sailor's clothing. He was probably the first to use the expression "to see the world" in reference to a reason for enlistment in the navy, a phrase now used on about every one of our recruiting posters. One idea long since adopted was that of having letters on official business sent through the mails without postage, since adopted in our system of franking letters dealing with public affairs.

In other medical matters, Cutbush advocated a pouch containing first aid materials to be carried by medical assistants, a forerunner of our Hospital Corps. He urged the establishment of a medical supply depot, a journal of military medicine, Marine guards at hospitals for police purposes, and the promotion of medical officers by selection. Most of his recommendations were made in his book published in 1808. A medical supply depot was not established until 1905, the *Naval Medical Bulletin* was first printed in 1907, and promotion by selection instituted in 1918. It is not surprising that this farsighted naval surgeon should be called the Nestor of the Medical Corps. He is certainly the father of naval medicine in America. Incidentally, he had a brother who was prominent in the early history of chemistry in the United States and wrote the first book published in this country on manufacture of pyrotechnics and fireworks.

Among the officers who accompanied Decatur on the ketch *Intrepid* in the burning of the *Philadelphia* in the harbor of Tripoli was Surgeon Lewis Heermann. Decatur left him in charge of the ketch during the boarding operation and he behaved throughout in an exemplary manner. Heermann was one of the most interesting figures among our early naval surgeons. He was born

in Cassel, Germany, and probably received his medical education in Germany. It is not known exactly when he came to this country, but he was appointed a Surgeon's Mate 8 February 1802. He was made Surgeon 27 November 1804. In his original acceptance of his appointment as Surgeon's Mate, in answer to the question of place of birth, he answered, "Politically (by adoption) Virginia; physically, Hesse Cassel, Germany." As a distinguished veteran of the war with the Barbary States, he was a subscriber to the famous Tripolitan Monument erected to the memory of officers killed in that war, and which now stands on the grounds of the Naval Academy at Annapolis near Sampson Hall. He wrote what was probably the first publication on first aid for use in our Navy—*Directions in the Medicine Chest.* This was intended to accompany the medicine chest prepared for gunboats on the New Orleans station and was printed by John Mowry in 1811. These chests were intended for use on smaller vessels not carrying a surgeon as part of their complement, and treatment was carried out by the commanding officer or someone designated by him. The pamphlet contained an "Index of Diseases" and this was followed by a list of the contents of the medicine chest. It includes about fifty items. There were syringes, "ipecac vomit," calomel, cantharides, a "cooling powder" and a "Toothache Tincture." A lancet was part of the equipment, and careful directions and indications for bleeding were given. A copy of this pamphlet was submitted to the Secretary of the Navy in 1811 and also in 1814.

Dr. Heermann, who went to New Orleans for duty in 1810, established what was essentially a naval hospital there. It must be remembered that naval hospitals such as we know them today did not then exist in this country, though there were institutions of that character in England and other European countries. The usual method employed was for the surgeon at a naval station to rent a house or other buildings and fit them up and equip them for the purpose. The surgeon bought the drugs, dressings, and other things necessary for the care of the sick and hired civilian employees. Heermann had "a cook, a carter and one orderly man" at New Orleans, and there is an excellent picture of the buildings and grounds of the place he used as a naval hospital. Hospitals of this type, really overgrown naval dispensaries, were at all the larger naval stations in the early days of the navy.

The Act of 26 February 1811 set up a separate naval hospital fund and placed it under three commissioners, the Secretaries of

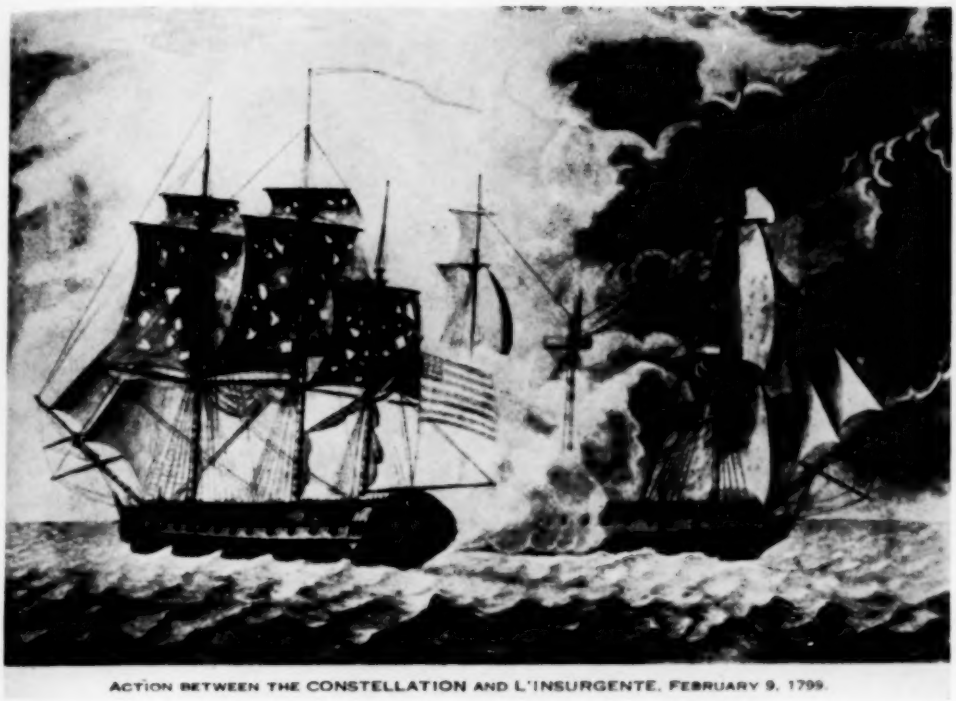
War, Navy, and Treasury. They at once had sites selected, architect's plans drawn, and estimates of construction costs made. Early in 1812 regulations for the organization and operation of naval hospitals were drawn up by a board of senior naval surgeons and these were issued on 25 May 1812 by Secretary Hamilton. The bed capacity of these hospitals was for 100 patients, and the staff was to consist of one surgeon, two surgeon's mates, one steward, one matron, one ward master, four nurses, one cook, two washwomen, three servants, and one porter. The surgeon was also "to act as physician," and it was considered desirable that the matron be the wife of the steward. Among other practical recommendations were that grounds of at least eight or ten acres surround the buldings and that each hospital should have a chaplain.

Heermann's professional and administrative abilities won him the esteem of his commanding officer and all the navy patients to whom he rendered professional service. He appears to have had an extensive consultation practice among civilians referred by medical men in New Orleans. His whole career was a distinguished one. In 1828 he was one of the officers to receive a sword from Congress for service in the Tripolitan war. In 1830 he was appointed fleet surgeon of the European Squadron. He received an "aiglet" (aiguillette) or shoulder knot with cords as a distinctive badge for staff officers. This was approved, and it is possible that he was the first American officer of a staff corps to wear the aiguillette. He died at New Orleans in 1833 and according to his will left property valued at $203,647.06, certainly a very large sum for those days and equivalent in purchasing power to several times that amount today.

The purchase of medical supplies of various sorts, medicines, surgical instruments, and surgical dressings in the early days of our navy were made in various ways. Sometime the surgeon of a ship was authorized to make purchases; in other instances they were bought by some designated naval agent (usually one in Washington or Philadelphia) who acted as a central purchasing agency, a sort of one-man supply depot. Well-known civilian physicians or apothecaries in other cities also apparently supplied drugs or instruments by purchase or request of the Secretary of the Navy. Finally the Purser at navy yards supplied "hospital stores" on requisition. These last items seem not always to have been drugs, but provisions, and such special foods for the sick as rice, sago, fresh eggs, milk, fruit, and also blankets, sheets, and similar articles. The following extracts from material in the National Archives give inter-

FIG. 1. Surgeon Isaac Henry, United States Navy.

FIG. 2. Medicine chest of Dr. Isaac Henry, one of the early Surgeon's Mates of our Navy.



ACTION BETWEEN THE CONSTELLATION AND L'INSURGENTE, FEBRUARY 9, 1799.

FIG. 3. The first frigate action fought by the United States Navy. Dr. Isaac Henry was serving as a Surgeon's Mate on the *Constellation* in this historic naval engagement. The battle was fought in the tropical moonlight in the heart of the West Indies, not far from the islands of St. Kitts and Nevis, on 9 February 1799.

FIG. 4. Dr. Louis Heermann, Surgeon, United States Navy. Professional skill and administrative ability were conspicuous in the career of this distinguished medical man whose naval service extended from 1802 until 1833.

esting data relative to the purchase of medical supplies in the early days of our navy:

1803, May 6 Secretary of the Navy to Dr. John Bullus, Surgeon, U. S. Navy, Washington: To send to Baltimore to Colonel John Stricker, Navy Agent, two chests of medicines and instruments, each calculated for 80 men, and to Philadelphia one chest for 120 men, directed to George Harrison, Navy Agent.* [From OSW (Officers Ships of War), Vol. 6.]

1803, July 9 Secretary to Dr. Bullus: "You will in future make your requisitions for Hospital stores upon Mr. Frazer, the Purser of the Yard." [OSW, Vol. 6.]

1805, Oct. 30 Secretary to Dr. S. R. Marshall, Surgeon, U. S. Navy, Philadelphia: "Purchase the necessary medicines on the best Terms in your power." [OSW, Vol. 7.]

1806, May 9 Secretary to Dr. Bullus: "When these chests of medicine shall be prepared, you will deliver them to the Surgeon of the *Chesapeake*, accompanied by bills, particularly expressing their contents, the Surgeon's receipt upon which will entitle you to payment." [OSW, Vol. 7.]

1806, June 17 Secretary to Dr. Bullus: "You will receive from the Navy Storekeeper by Inventory all the Medicine and Surgical Instruments on hand which you will take charge of and keep in preservation and repair. You will likewise on the arrival of a Ship receive from the Surgeon the Medicine & Instruments remaining on hand, giving such Surgeon a receipt, therefor to be returned to the Accountant of the Navy. You will render monthly statements of the receipts & expenditures of all Medicines and Instruments belonging to the publick in your hands."

"As a compensation for your services including Store-Rent, Clerk-hire, and all other assistance you will be allowed an annual Compensation of Drs. 400."† [OSW, Vol. 7.]

1806, Sept. 6 Secretary to Dr. Bullus: "Mr. James S. Stevenson states his having purchased your Establishment and proposed to furnish Medicines for this Department. I have no objection to your purchasing of him the medicines wanted, provided he will furnish them on as reasonable terms as they can be procured in the District."‡ [OSW, Vol. 7.]

1807, Feb. 25 Secretary to Dr. Bullus: Informs him that Dr. Thomas Ewell has been ordered to take charge of the public medicines and instruments now in his charge. [OSW, Vol. 7.]

1807, Aug. 28 Secretary to Dr. Ewell (in response to a letter from him dated August 25): "The hospital stores you will procure of any person who can furnish them of a good quality and on the cheapest terms." [OSW, Vol. 7.]

* All medicine chests at that time seem to have been prepared by Dr. Bullus upon orders from the Secretary.

† Dr. Bullis owned an establishment for the sale of drugs, etc.

‡ Stevenson had been employed by Dr. Bullis to manage his store.

1819, Oct. 19 Stephen Decatur, Navy Commissioners Office, to Dr. Edward Cutbush, Surgeon, U. S. Navy, Washington: "The Commissioners of the Navy request that you will proceed to purchase on the best terms in your power all the Medicines and furniture required for the dispensary of the Ship *Columbus*—also all the hospital stores which are procurable only at Druggists shops, such as sage, arrow root, tapioca; such surgical instruments as may also be on hand you will cause to be put in proper order for the ship, holding them as well as the medicines, furniture &c ready to be put on board the ship when required, and you will be pleased to report to this Board the deficiency of the various kinds of instruments—and should you find it impracticable to procure all the medicines within this district you will be pleased to inform the Commissioners of such as you can't procure, stating at the same time where they can be obtained on the best terms. Your bills of purchase under this order are to be signed & approved by you and then brought by the persons of whom the purchases shall be made for the payment." [Misc. Letters, No. 2, Navy Commissioners Office.]

1820, Mr. 13 R. Jeffery & A. Galt to the Board of Navy Commissioners: "Agreeable to your advertisement of the 26th Feby. last, we propose to contract for Medicines & Instruments for this station (Norfolk) on the following terms . . ."* [Navy Dept. Dept. Archives, Class 2, ME.]

The naval hospitals such as that maintained by Heermann were really large dispensaries, though constantly referred to in official correspondence as hospitals. The hospitalization of the sick or injured in our navy originally consisted in leaving them ashore in civilian hospitals, or more often in private homes and paying for the medical and nursing care and subsistence. Payment was generally made to the local physician in charge of the case or cases, and he was responsible then for making the payment for the shelter, nursing care, and food. In some instances, the bills for medical care, nursing, and board were rendered separately. Such a method of hospitalization was not very satisfactory, as the accommodations for the sick and the professional care that could be provided were often inadequate. Administrative supervision by the navy was difficult, the patient when recovered was often separated from his ship and desertion and malingering were facilitated, indeed almost encouraged by such a system of medical care. Naval hospitals had long existed in England, France, and other European countries.

* This is the first instance we have found showing the purchase of medical stores by contract. Following the publication of this advertisement, the Government began to receive bids or proposals and apparently sent out printed forms for the use of the bidders. The earliest one found is in longhand and was submitted by N. Jewitt, Washington, D. C., 18 March 1820.

Both Cutbush and Barton recommended the construction of naval hospitals. It is seen that in New York, Philadelphia, Norfolk, New Orleans, and other places naval hospitals were operated, although they were really enlarged and specialized dispensaries and thus the precursors of the later naval hospital authorized and constructed under the special authority of Congress. It is true, however, that a distinction in title was made between the dispensary and hospital at an early date. Many of the old Navy Registers of Officers show a surgeon on duty at "Sick Quarters" in a Navy Yard, and "Hospital" at or near a Navy Yard.

The origin and history of naval hospitals in the United States is closely linked with the Naval Hospital Fund. This fund was originally created for merchant seamen by an Act of Congress that passed the House of Representatives on 12 April and then the Senate on 16 July 1798. It was signed by President John Adams on the latter date. The Bill was introduced into the House on 28 February 1798 by Mr. Robert Livingstone of New York, who may be said to be the father of our naval hospitals. It is fitting to think this important measure should have been signed by John Adams, who with George Washington, Theodore Roosevelt, and Franklin D. Roosevelt may be considered as the most navyminded of all our Presidents. On 2 March 1799, the Act was extended to include the naval service. Money for the fund was obtained by the deduction of twenty cents a month from the wages of merchant seamen, and the Act including the Navy authorized the Secretary of the Navy to deduct the same amount monthly from the pay of "every officer, seamen and Marine." By 1811 the fund contained nearly $75,000. As a much greater part of this money had been paid by naval personnel, the Secretary recommended that a trust be set up separate from the Merchant service, and this was accomplished by an Act of Congress of 26 February 1811. At this time, $55,649.29 was the amount paid in by officers and men of the Navy, and $55,000 was transferred to the new Naval Hospital Fund. This Act of 1811 merely segregated part of the fund for naval hospitals and separated it from the Marine Hospital Service that cared for seamen of the Merchant Marines. At this time all fines from courtsmartial were also ordered paid to the Naval Hospital Fund.

The naval medical establishments referred to at the time as naval hospitals and the cost of maintenance are shown in the following document published in America's State Papers for 1818:

Estimate of the annual expenses paid by the Navy Department on account of Navy Hospitals, established at the following places, since the passage of the act of the 26th February, 1811.

New Orleans		
Rent of house for hospital and surgeon's quarters	$1,560.00	
Surgeon's pay and rations	782.50	
Surgeon's mate's pay and rations	542.50	
		$2,885.00
Charleston, S. C.		
Rent of house for hospital	350.00	
Surgeon's pay and emoluments	782.50	
Rent of quarters for ditto	198.00	
Surgeon's mate's pay and rations	200.00	
		1,873.00
Washington City		
Rent of house for hospital	200.00	
Surgeon's pay and rations	1,126.48	
Rent of quarters for ditto	400.00	
Surgeon's mate's pay and emoluments	632.00	
Rent of quarters for ditto	542.50	
		2,558.48
Philadelphia		
Pay and rations of surgeon	782.50	
Rent of quarters for ditto	500.00	
Pay and rations of surgeon's mate	542.50	
		1,825.00
New York		
Rent of a house for hospital	450.00	
Pay and rations of surgeon	782.50	
Rent of quarters for ditto	500.00	
Pay and rations of two surgeons' mates	1,085.00	
		2,817.50
Charlestown, Mass.		
Pay of a surgeon	782.50	
Rent of quarters for ditto	500.00	
Pay and rations of surgeon's mate	542.50	
		1,825.00
Total amount of annual expense		$13,783.98

CONST. FREEMAN, Auditor
Treasury Department
Fourth Auditor's Office
January 13, 1818.

Great hopes were aroused among our naval surgeons by the establishment of the Naval Hospital Fund, but it was some time before the naval hospitals they visualized were built. Indeed, it was not until 20 years or more later that real action took place and naval hospitals were built at Norfolk, Virginia, Chelsea (Charlestown), Massachusetts, and New York. The delay was due in the main to two causes. The first was lack of sufficient money in the

Fund to do more than assist the medical departments at the principal navy yards. Then there was the fact that the money was administered by a board of naval commissioners who had many other tasks and were no doubt often divided in their views. This clumsy organization was abandoned when the Secretary of the Navy was given charge of the Fund.

At the commencement of the War of 1812 there were 26 Surgeons and the same number of Surgeons' Mates on the Navy list. In 1814 this had risen to 43 Surgeons and 44 Surgeons' Mates, an indication in some degree of the increase in size of the Navy during this war. In 1814, Edward Cutbush was the senior Surgeon of the Navy, his commission dating from 24 June 1799. Peter St. Medard, with his commission dating from 14 July, the same year, was next in order of seniority. Among the Surgeons' Mates were Usher Parsons, who was with Perry at the Battle of Lake Erie, W. P. C. Barton and Thomas Harris, afterwards the first and second Chiefs of the Bureau of Medicine and Surgery, Richard C. Edgar, the Surgeon of the *Chesapeake* in the engagement with the *Shannon,* and Amos Evans, Surgeon of the *Constitution* in her famous battles with the *Guerriere* and the *Java.*

The Surgeons and Surgeons' Mates who shared in the battles and dangers shared also in the rewards. They were included in the official thanks of Congress and medals struck to commemorate the various naval actions, and in the prize money distributed. Isaac Henry, Surgeon of the *Constellation,* and Surgeon's Mate John Murdaugh were the first medical men of our Navy to be the recipients of such an honor as the thanks of Congress, for the victory over the French frigate *Vengeance.* The date of this Congressional Resolution was 29 May 1800. Louis Heermann, James Wells, Samuel R. Marshall, M. T. Weems, John W. Dorsey, Larkin Guffin, I. Graham, and G. R. Jacques were Surgeons who shared in the Congressional Resolution of 3 March 1805 for operations off Tripoli during July, August, and September, 1804, and altogether there were 38 Surgeons and Surgeons' Mates included in Congressional Resolution for service in the Quasi-War with France, the Tripolitan Wars, and the War of 1812.

The substantial reward of prize money was also received by these officers with their other shipmates. The method of such a distribution was to divide it into 20 parts which were then disbursed as follows:

Captain	3 Parts
Lieutenants and Master	2 Parts
Surgeon, Marine Officer, Chaplain, Purser, Boatswain, and Gunner	3 Parts
Carpenter, Master's Mates, Midshipmen, Surgeon's Mates, Captain's Clerk, Schoolmaster, Boatswain's Mates, Steward, Sailmaker, Master at Arms and Coxwain	3 Parts
Petty Officers and Crew	9 Parts

As an example, in the distribution of prize money for the Battle of Lake Erie, Commodore Perry received $7,140, John Y. Yarnell, a sea lieutenant, received $2,295, Ushur Parsons, Acting Surgeon $1,214.29, and a seaman $214.89. A sergeant of Marines, a drummer, a fifer, and a corporal received $447.89. These were substantial amounts, considering the greater purchasing value of money at the time and the amount of pay received. The Surgeon's pay with one ration amounted to $600 a year, so that the amount received by Dr. Ushur Parsons was approximately two years' pay. The prize money in the case of Lake Erie, and indeed most of the engagements of the War of 1812, was voted by Congress in 1818. While the laws and regulations regarding the distribution of the prize money varied somewhat from time to time, at the beginning of the 19th century in the U. S. Navy, the government took one-half of the total value of the prize after deduction of the usual expenses of the Prize Court for the advertisement and sale of the captured vessel, the other half being distributed to the officers and men of the vessel making the capture. In the case of small vessels captured by a ship such as a frigate carrying three hundred to four hundred officers and men, the share of the surgeon or surgeons' mates was small, but a large and richly laden merchantman or two gave a very substantial amount and represented a real incentive to a naval surgeon.

The pay of Surgeons and Surgeons' Mates was augmented on shore duty by certain allowances. The Surgeon was allowed $2.00 a month house rent, $8.00 a month for a servant, $20.00 a month for candles and food, and 20 cords of wood. The Surgeon's Mate received 14 cords of wood, $1.45 for rent, $6.00 a month for a servant, and $16.00 for candles, etc.

The uniforms of Surgeons and Surgeons' Mates were first prescribed officially on 27 August 1802, and were as follows: That for the surgeon was a full dress coat of blue with a standing collar and

gold lace extending down the lapels of the coat to the bottom. There were nine gold buttons and gold frogs on the lapels, two buttons and frogs on each side of the collar, three below the pockets matched by three gold frogs on the pocket flaps, and three buttons and gold frogs on each cuff. The Surgeon's Mate had the same sort of coat as the surgeon but without the frogs, though in lieu thereof the buttonholes were worked in gold thread. The button for all officers had on it the foul anchor with the American eagle perched on the shank and a circle of thirteen stars; in fact, it was practically identical with the button worn today on officers' uniforms. There is a tradition that those on the cuffs were put there to prevent the "young gentlemen" (the midshipmen) from using the cuff as a handkerchief. The cocked hat was regularly worn with full dress. The sword was similar to the present naval sword; the surgeon's mate wore a dirk. A round hat, blue trousers, and the dirk could be worn in undress. The general use of trousers instead of knee breeches came during the period from 1810 to 1820, and in 1813 trousers were prescribed in the Uniform Regulations. This was for the dress uniform. A short jacket was the usual coat for daily wear, absurdly short in the midshipman's dress, and referred to by them as a "monkey jacket."

Thus within less than 15 years after the inauguration of Washington the young Navy of the new Republic had been established, was showing the flag in port and at sea, had fought in two wars, and had already created a tradition of victory and valor. In all this the infant Medical Department had borne its part with credit and even with distinction.

Caspar Friedrich Wolff and his 'Theoria Generationis', 1759

RICHARD P. AULIE*

> My frame was not hidden from thee,
> when I was being made in
> secret, . . .
> Thy eyes beheld my unformed
> substance.
>
> —Psalm 139: 15-16

I.

IN 1759 a young medical student in northern Germany put the final touches on a manuscript written in the Latin language.[1] Caspar Friedrich Wolff was only 26 when he lettered the words, *Theoria generationis,* on the title-page of the dissertation that he thought would be only the final requirement for his medical degree. He had no idea his work would plunge him into a life-long controversy he could not possibly win but which would earn him eventually an important niche in the history of science.[2,3]

Wolff spent his early life in Berlin where he was born in 1733, the son of a tailor. After obtaining his medical degree at the College of Medicine in Berlin, he went on for the doctorate at the University of Halle. In his doctor's thesis he marshalled strong arguments for epigenesis, the subject that occupied his attention for the rest of his life. On graduation from Halle he served a short tour of duty as an army surgeon before returning to assume a lectureship in medicine at the College of Medicine.

It was not long before he encountered difficulties. Wolff's views on embryology were not well received by his more conservative colleagues, or, indeed, by many biologists of the day, making it virtually impossible for him to maintain his teaching post in Germany. Meanwhile, he had attracted the attention of the Tsarist Empress Catherine the Great, who in 1766 invited him to become a member of the Russian Academy of Sciences in St. Petersburg. He accepted, and there as an academician he found sanctuary for the

* Bloom Township High School, Chicago Heights, Illinois.

1 Wolff, C. F. *Theoria generationis.* Halae ad Salam, Litteris Hendelianis, 1759. 146 pp.

2 Kirchhoff, A. Caspar Friedrich Wolff. Sein Leben und seine Bedeutung für Lehre von der organischen Entwickelung. *Jena. Z. Med. Naturw.,* 1868, *4,* 193.

3 Wheeler, W. M. Caspar Friedrich Wolff and the Theoria Generationis. In: *Biological lectures,* Marine Biological Laboratory, Wood's Hole, Mass., 1898, Lecture 15, pp. 265-284.

remaining 30 years of his life, with ample opportunities for pursuing his cherished studies of embryology.[4–7]

His more mature work is the *De formatione intestinorum* published in Russia in 1768 and 1769.[8] In it he summarized his extensive investigations of chick embryology that substantiated his earlier theoretical account of epigenesis. In St. Petersburg he also conducted his long controversy with Albrecht von Haller.[9] Wolff died in 1794, unaware of the far-reaching implications of his life's work.

Although Wolff wrote in Latin, he translated his *Theoria* into German for an edition that appeared in 1764.[10] A second Latin edition followed in 1774.[11] For many years little attention was devoted to his works. Then in 1812 the distinguished German anatomist, Johan Friedrich Meckel, prepared a German translation of his work on the formation of the intestine with the title *Ueber die Bildung des Darmkanals im bebrüteten Hühnchen.*[12] This edition undoubtedly quickened interest in Wolff's views. It was followed in 1896 by a new German version of the *Theoria,* translated and published by another admirer, Paul Samassa, who claimed the book insured Wolff's enduring fame.[13]

Briefly stated, there are three aspects to Wolff's importance: (a) He applied the *coup de grâce* to the 18th century preformation theory, particularly as it was expressed in the notion of *emboîtement* (or encasement), which claimed that organisms existed completely formed in the egg or sperm. (b) His work illustrates the fact that for real progress in biology there must be a proper balance between observation, theory, and experimentation. (c) He firmly injected into modern biology the ancient doctrine of *epigenesis,* namely, that organisms develop in stages by a gradual increase in the visible complexity of organization rather than by a simple

4 Kirchhoff (note 2), p. 197.

5 Ravitch, M. L. *The romance of Russian medicine.* New York, Liveright Publishing Co., 1937, 352 pp. (pp. 102, 103).

6 Hall, T. *A source book in animal biology.* New York, McGraw Hill Book Co., Inc., 1951, 716 pp. (p. 372).

7 Wolff, C. F. *Theoria generationis.* Halae ad Salam, J. C. Hendel, 1774, 231 pp. (p. vi).

8 Wolff, C. F. De formatione intestinorum. *Novi commentarii academiae scientiarum imperialis Petropolitanae,* 1768, *12,* 403-507; 1769, *13,* 478-530.

9 Nordenskiöld, E. *The history of biology.* New York, A. A. Knopf, 1928, 629, xv pp. (pp. 248, 249).

10 Wolff, C. F. *Theoria von der Generationem.* Berlin, Gedruckt bey F. W. Birnstiel, 1764, 283 pp.

11 Wolff (note 7).

12 Wolff, C. F. *Ueber die Bildung des Darmkanals im bebrüteten Hühnchen.* J. F. Meckel, Tr. Halle, Reugersche Buchhandlung, 1812, 263 pp.

13 Wolff, C. F. *Theoria generationis.* Paul Samassa, Tr. Leipzig (Ostwald's Klassiker der exakten Wissenschaften, Nr. 84 and 85.), Verlag von Wilhelm Engelmann, 1896. 95 pp.

enlargement of an already mature though minute organism. This was undoubtedly his most significant achievement.

Modern embryology thus owes a great deal to Caspar Friedrich Wolff. At the same time it is well to remember that embryology could not advance appreciably without the important period of morphological description that followed in the remainder of the 18th and throughout the 19th centuries. So necessary was morphology that embryology could not "arrive" as an experimental science until the appearance in 1889 of Wilhelm Roux's work on causal embryology, *Entwicklungsmechanik*.[14] Nevertheless, if Wolff's mature conception of epigenesis had been promptly accepted, modern embryology should perhaps have experienced even more rapid progress and would not appear as theoretically threadbare as it often does today.

II

It is an axiom of embryology that an event in the development of an organism cannot be fully apprehended apart from an analysis of the events leading up to it. By the same token, in order to grasp the condition of modern embryology, its historical foundations must be traced. These go back to the 16th, 17th, and 18th century physicians who signalled the opening of our era by giving biology a new dignity.

Those centuries were times of ferment. The hollow Aristotelian *Weltanschauung* was rapidly crumbling and an entirely new world-life view was being shaped in its stead. Diverse scientists and philosophers re-emphasized the intelligibility of the universe and outlined the method for implementing that assumption, while noting the usefulness of doubt in the search for truth. Thus the optimistic mood was set for the years to come.[15,16]

Even though it was the age of Enlightenment (*Aufklärung*), the Wolff-Haller controversy transpired in a time which was a "fallow" period as far as biology was concerned. There were only a few anatomists worthy of the name such as Lieberkühn, Camper, John Hunter, and Friedrich Kielmeyer. Of all the biologists, Carl

[14] Roux, W. The problems, methods, and scope of developmental mechanics. An introduction to the "Archiv für Entwickelungsmechanik der Organismen." W. M. Wheeler, Tr. In: *Biological Lectures*, Marine Biological Laboratory, Wood's Hole, Mass., 1894, pp.149-190.

[15] Butterfield, H. *The origins of modern science*. London, G. Bell and Sons, 1957, 242 pp.

[16] Dampier, Sir W. C. *A history of science and its relations with philosophy and religion*. Cambridge, University Press, 1942, 574 pp.

THEORIA
GENERATIONIS

QVAM

PRO GRADV DOCTORIS MEDICINAE

STABILIVIT

publice eam defensurus d. 28. Novembr. 1759. h. l. q. s.

CASPAR FRIDERICVS WOLFF

BEROLIN-BRAND.

CVM II. TABVLIS AENEIS.

HALAE AD SALAM

LITTERIS HENDELIANIS.

FIG. 1. The title-page of Wolff's dissertation. He defended his thesis for his medical degree from the University of Halle in Germany on 28 November 1759, arguing that all organisms develop gradually instead of being preformed. (Courtesy National Library of Medicine.)

Linnaeus is perhaps the best known through his *Systema naturae,* which first appeared in 1735.[17] Besides Wolff and Haller, there were no embryologists of note between Malpighi in the 17th century and von Baer in the 19th. Wolff was necessary for the future of embryology, but he occasioned very little stir in his own lifetime.

Thus the 18th century remained a time of momentary calm during which the gains previously achieved by the closer union of medicine and natural philosophy were consolidated. Botany continued to serve the art of medicine by the ancient craft of herbalism. No one considered it strange, therefore, that such gifted physicians as Haller and Wolff should study plants. Moreover, many thinkers, such as Goethe and Bonnet, were later impressed by the need to reconcile the important past discoveries into a uniform law.[18]

Why did a brilliant man such as Haller resist the truth that organisms develop gradually? How could Wolff, a young medical student with far less experience and no greater intellect, peer through his microscope and come up with what we consider to be obvious? Why was there resistance to new ideas?

R. G. Collingwood suggests in his *Idea of History* that to understand the origin of an idea one must mentally enact past events and then consider what made them possible. One must ask what changes occurred to bring about the conditions seen in the present.[19] Only thus can one understand the difficulties faced by Haller and Wolff in their efforts to disentangle developmental problems. Perhaps this is ultimately impossible, for the useful 19th century abstractions—the cell, the gene, and evolution—are now deeply buried in our minds. Although dimly perceived by Wolff, these abstractions were not available to him as useful tools of thought. Scientific progress can occur only as fast as the general state of technical knowledge will allow. Wolff exploited his microscopes to their fullest and went as far as he could in the absence of workable theories.[20,21]

17 Linnaeus, Carolus von. *Systema naturae.* Editio decima. Holmiae, imp. L. Salvii, 1758.

18 Hall, A. R. *The scientific revolution,* 1500-1800. Boston, Beacon Press, 1956, 390 pp.

19 Collingwood, R. G. *The idea of history.* New York, Oxford University Press, 1956, 339 pp.

20 Guyenot, E. *Les sciences de la vie aux XVIIe et XVIIIe siècles. L'idée d'evolution.* Paris, Editions Albin Michel, 1941.

21 Sarton, G. *A guide to the history of science.* Waltham, Mass., Chronica Botanica Co., 1952, 316 pp.

III

The various strands of his thinking were undeniably rooted in two major sources: the "monad" of the mathematician-philosopher, Gottfried Wilhelm Leibniz (1646-1716), and the animistic vitalism of the physician-chemist, Georg Ernst Stahl (1660-1734).[22,23]

The philosopher who developed the calculus described monads as 'individuals' and as the ultimate centers of force in the universe. To him they were metaphysical points and thus quite distinct from the concrete Democritean atoms of the 5th century B.C. He said that "the monads are the true atoms of nature; in a word, they are the elements of things . . . monads have no windows through which anything could enter or depart."[24]

This was eminently successful in those days. The classical microscopists, Malpighi, Leeuwenhoek, Hooke, and Swammerdam, coming as they did in the latter 40 years of the 17th century, had already made prolific observations of vast worlds in miniature.[25] People were learning that all manner of tiny creatures and structures exist even where none may be seen with the naked eye. Leibniz wrote that "we see that a world of creatures, living beings, animals, entelechies, souls, exists in the minutest parts."[26] Even though reasonable in his time, such an abstraction as the monad seems quaint to our contemporary minds, for few biologists today feel the need of examining their own philosophical assumptions, much less articulating them. They often sidestep the need to come to terms with awkward philosophical assumptions. But the Leibnizian system of monads quickened considerable interest in morphological research, particularly on the microscopic level, by helping to emphasize the dynamic diversity of life and by explaining life phenomena in terms of "force" rather than by Aristotelian motion. Wolff used the monad idea, but he left untouched the bulk of Leibniz' philosophy, for it was the doctrine of preformation which he assailed.

The other source of Wolff's thinking was a conception of vitalism borrowed from Stahl, whose phlogiston theory unified many diverse phenomena in 18th century chemistry until the time of the

22 Kirchhoff (note 2), pp. 201, 202.

23 Meyer, A. W. *The rise of embryology*. Stanford, University Press, 1939, 367 pp. (p. 56).

24 Leibniz, G. W. The Monadologie, 1714. In: Leibniz, *Philosophical papers and letters*. Chicago, University of Chicago Press, 1956, 1228 pp. (vol. 2, pp. 1044, 1045).

25 Dobell, C. *Antony van Leeuwenhoek and his "Little animals."* New York, Russell and Russell, Inc., 1958, 435 pp.

26 Wightman, W. P. D. *The growth of scientific ideas*. New Haven, Yale University Press, 1951, 495 pp. (p. 230).

ill-fated Antoîne Lavoisier. Stahl was a vitalist; he believed that all body functions, such as digestion and absorption of food, excretion, respiration, muscular activity, and the like, occur for the sake of the soul. He employed vitalism in writing his medical text, the *Theoria medica vera,* producing a clearly Aristotelian and animistic approach to explaining life processes.[27] Many readers found his views a penetrating criticism of the mechanical explanation of life that had sprung from the 17th century philosophy of René Descartes. Stahl had numerous followers; among them was Wolff, who freely acknowledged his debt to the physician.[28]

Vitalism today has no popularity. The very existence of physiology, embryology, and chemical genetics make unnecessary any immaterial, non-spatial agency to explain living phenomena. Nevertheless, remnants of Stahl's views, with roots reaching back to Aristotle, may be traced through the *vis essentialis,* as Wolff called it, down to the sub-human *entelechy* of Hans Driesch and the emergent *élan vital* of Henri Bergson in more recent times, as a reminder of the continuing mysterious element in life phenomena.

The preformation *versus* epigenesis question has often exercised biologists. The theme of epigenesis is certainly the older of the two and goes back to ancient times. It is present in the early biology of Aristotle (384-322 B.C.), as expressed in Books I, II, and III of his *De generatione animalium* and in Book VI of his *Historia animalium,* wherein he recorded his observations of chick embryology.[29,30] He appreciated the true nature of development as constituting a gradual process of building and not merely an increase in size through growth alone, as the preformationists were to affirm.

Furthermore, the dynamic, baroque biology of William Harvey (1578-1657), whose work preceded that of Malpighi, was definitely epigenetic in character. This may be noted in his *Generation of Animals,* published in 1651, in which he argued correctly that

> . . . the generation of the chick from the egg is the result of epigenesis, . . . all its parts are not fashioned simultaneously, but emerge in their due succession and order; it appears, too, that its form proceeds simultaneously

27 Stahl, G. E. *Theoria medica vera.* Halae, Literia Orphanotrophei, 1718, 1432 pp.
28 Nordenskiöld (note 9), p. 183.
29 Aristotle. *Generation of animals.* A. L. Peck, Tr. Cambridge, Harvard University Press, 1953, 607 pp.
30 Aristotle. *History of animals.* Richard Cresswell, Tr. London, George Bell and Sons, 1862, 326 pp.

with its growth, and its growth with its form; also that the generation of some parts supervenes on others previously existing, ...[31]

Thus, a full century before Wolff published his controversial works, Harvey advocated the ancient tradition that development is a process of becoming, thereby emphasizing differentiation as well as growth.[32]

The preformation to which Wolff was antagonistic was a rather picturesque and temporary interruption that vexed and delayed biology from about the time of Malpighi (1628-1694) until the close of the 18th century. Certain of Malpighi's predecessors had been attracted to preformation during the early years of the microscope subsequent to Harvey and had helped prepare the ground for the later enunciations of the heresy. The biologists whose influence helped to establish preformation as an accepted doctrine in embryology included Swammerdam, Maître-Jan, Buffon, and Bonnet.[33–36]

The theory even overcame the influence for epigenesis the brilliant work of Marcello Malpighi might have had. In 1672 he published the two tracts, *De ovo incubato* and *De formatione pulli in ovo*,[37] in which he remarked that growth or "evolution" occurs by an unequal folding and by what today might be called differential growth rates. In a translation by Joseph Needham he says:

. . . when we inquire carefully into the production of animals out of their eggs, we always find the animal there, so that our labor is repaid and we see an emerging manifestation of parts successively, but never the first origin of any of them.[38]

Malpighi never developed a complete theory of generation, but we may note definite epigenetic phrasing—*"an emerging manifestation*

31 Harvey, W. Anatomical exercises on the generation of animals . . . , 1651. In his: *Works*. Robert Willis, Tr. London, Sydenham Society, 1847, 624 pp. (p. 336).

32 Wolff (note 7), p. xxiii.

33 Swammerdam, J. *The book of nature*. Translated from the Dutch and Latin original edition by Thomas Floyd. London, John Hill, 1758.

34 Maître-Jan, Antoine. *Observations sur la formation du poulet*. Paris, d'Houry, 1722, 326 pp.

35 Buffon, G. L. L. de. *Histoire naturelle des animaux*. Paris, 1749 ff.

36 Whitman, C. O. Evolution and epigenesis. In: *Biological Lectures*, Marine Biological Laboratory, Wood's Hole, Mass., 1894, 205-224; Bonnet's theory of evolution. A system of negations. *Ibid.*, 225-240; The Palingenesia and the germ doctrine of Bonnet, *Ibid.*, 241-272.

37 Malpighi, Marcello. De ovo incubato; De formatione pulli in ovo, 1672. In his: *Opera omnia*. Londini, Apud Robertum Scott et Georgium Wells, 1686.

38 Needham, J. *A history of embryology*. New York, Abelard-Schuman, 1959, 304 pp. (p. 168).

of parts successively"—in this passage. Some historians of biology, however, have considered him a preformationist.[39-43]

In Malpighi's publications there are excellent descriptions of successive stages of chick embryology with ten exquisite plates.[44] The drawings are clearly superior to those hurriedly sketched by Wolff three quarters of a century later. Considering the beauty of Malpighi's drawings illustrating epigenesis, it is a wonder that so many could have believed in preformation at all. But they did. Among the preformationists were otherwise first-class scientists whose prejudice was so strong they could believe one thing (preformation, or predelineation), see quite another (epigenesis), and yet interpret their observations as supporting the former.

Despite the sound principles laid down by William Harvey and the careful observations made by Marcello Malpighi, the tide began to turn rapidly away from epigenesis toward the close of the 17th century. As the 18th century progressed, there were indeed few prominent physicians who disagreed with the preformation theory.

Two dissenting voices that remained were Emmanuel Swedenborg and Pierre Maupertuis who contended for epigenesis in the early part of the 18th century. Few listened to them, but they were prophets of things to come.[45-48]

Preformation (*praedelineationis systemata*), as elaborated by Maître-Jan, Swammerdam, Haller, and Bonnet, was not entirely speculative. Since the notion was based on rather good observations, considering the primitive microscopes available, they could not realize that conclusions were being drawn from untenable *a priori* assumptions.[49] Because the microscope had not yet determined the lower limits of observable size, preformation did not

39 Locy, W. A. *Biology and its makers.* New York, Henry Holt and Co., 1908, 469 pp. (p. 207).

40 Meyer (note 23), p. 84.

41 Needham (note 38), pp. 163-170.

42 Oppenheimer, J. M. Problems, concepts, and their history. In: *Analysis of development.* B. H. Willier, etc., Eds. Philadelphia, W. B. Saunders, 1955, 735 pp. (p. 6).

43 Cole, F. J. *Early theories of sexual generation.* Oxford, Clarendon Press, 1930, 230 pp. (pp. 48-50).

44 Malpighi (note 37).

45 Swedenborg, E. *Regnum animale.* [Written 1744.] Tübingen, 1849. English tr., London, 1852.

46 Maupertuis, P. L. M. de. *Vénus physique, contenant deux dissertations, l'une sur l'origine des hommes et des animaux; et l'autre sur l'origine des noirs.* La Haye, 1745. (Also in: *Oeuvres,* vol. 2, pp. 1-134.)

47 Maupertuis. *Système de la nature,* 1751. In: *Oeuvres.* Lyon, J. M. Bruyset, 1756. 4 vols. (vol. 2, pp. 135-184).

48 Glass G. Maupertuis, pioneer of genetics and evolution. In: *Forerunners of Darwin, 1745-1859.* B. Glass, etc., Eds. Baltimore, Johns Hopkins Press, 1959, 471 pp. (pp. 51-83).

49 Wolff, 1774. (note 7), pp. xxix, lxii, lxiv.

seem to present logical difficulties. For example, the achromatic microscope, the oil immersion principle, and sub-stage illumination were not developed until after 1830.[50,51] Preformation also represented a revolt against Aristotelian authority in science; and Wolff lived in the Age of Enlightenment.

Carried to its logical conclusion, preformation meant that each fertilized egg contained a fully developed, microscopic, and preformed human being. To the preformationist, development was merely a growth or enlargement through the addition of food rather than growth together with differentiation, as the problem is considered today. From this notion a fruitless quarrel arose between the "ovists" and the animalculists," who argued whether eggs or sperm contained the creatures. A classic statement of preformation is found in Leibniz' *Monadologie:*

> . . . when exact investigations . . . have shown that the organic bodies of nature are never produced from chaos or from putrefaction, but always through seeds in which there is undoubtedly some *preformation,* it has also been concluded . . . that the organic body was already there before conception . . . and, in a word, that the animal itself was there, . . .[52]

The unfortunate outcome of preformation was the doctrine of *emboîtement,* or *Einschaetelung:* the encasement of diminutive human beings in eggs, which contained more diminutive human beings, which had yet other eggs.[53] Some biologists tried to calculate how many generations of human beings were imprisoned in Mother Eve, and with this information they went on to determine the probable date for the end of the world.[54]

Without the fine observations of Swammerdam, Leeuwenhoek, and Haller, preformation probably could not have survived the clear light of day. Moreover, the writings of Leibniz and Bonnet were popular in the public eye, and their espousal insured preformation widespread interest. Religious issues were also involved; it was but a short step to the suggestion that these multitudes of fully formed creatures encased in eggs were all made *ab initio* by divine decree. It was clearly a struggle Wolff could not win.

50 Clay, Reginald S. and Court, T. H. *The history of the microscope.* London, Charles Griffin and Co., Ltd., 1932, 266 pp.

51 Singer, C. *A history of biology.* New York, Abelard Schuman, 1959, 580 pp. (p. 173).

52 Leibniz (note 24), p. 1057, par. 74.

53 Wolff (note 7), p. xxxvi.

54 Locy (note 39), pp. 208-210.

IV

When the *Theoria generationis* went to press in 1759, Albrecht von Haller was considered an authority in many areas in science. By the sheer number of his publications, he easily superseded Wolff, who could claim only two. One historian reports that Haller wrote 13,000 scientific articles,[55] a somewhat far-fetched assertion even for one who was called "great" in his own lifetime.[56] In his *Elementa physiologiae,* first published in 1757, Haller demonstrated that contractility is a specific property of muscle, and irritability that of nerve, that cardiac muscle can beat autonomously, and that bile is used in digestion.[57] Indeed, his *Elementa* ushered in the beginning of modern physiology.[58]

Wolff could not have chosen a more eminent man in science to whom to dedicate his treatise. Haller represented not only the climax of 18th century biology, resting as it did on the weight of observations stretching across a full century, but also the culmination of baroque ideals stemming from Leibnizian monadology.[59]

Haller was actually an epigenicist in the early stages of his career. He noted that the phenomena of regeneration as they may be observed in certain invertebrates such as Hydra and Crustacea, when considered with the development of the vertebrate heart, which gradually assumes its adult structure from a simple tube-like origin, all indicate that preformation is a false view. He claimed rather that organs develop gradually according to principles first propounded by Aristotle and later by Harvey. But as he became more deeply immersed in chick studies he gradually changed his mind until by 1758 Haller was definitely a preformationist. Even though he argued thereafter from first-hand observations which he had made, this transformation from epigenesis to preformation was definitely retrograde.[60]

Embryology was thus one of the few spheres in which he erred, for there preformation carried him quite away. In his monumental *Elementa* he wrote: "There is no new development; no part in the

55 Garrison, F. H. *An introduction to the history of medicine.* Philadelphia, W. B. Saunders, 1929, 996 pp. (p. 317).

56 Castiglioni, A. *A history of medicine.* New York, A. A. Knopf, 1947, 1192 pp. (p. 610).

57 Haller, A. von. *Elementa physiologiae corporis humani.* Lausannae, sumptibus M.-M. Bousquet et sociorum, 1766, 8 vols. (vols. vii and viii, "Generatio").

58 Garrison (note 55), p. 318.

59 Friedell, E. *A cultural history of the modern age.* New York, A. A. Knopf, 1933, 3 vols. (vol. 2, "Baroque and Rococco").

60 Cole (note 43), pp. 48-50.

ELEMENTA PHYSIOLOGIÆ CORPORIS HUMANI.

AUCTORE

ALBERTO v. HALLER,

DOMINO IN GOUMOENS LE JUX, ET FEUDI ECLAGNENS.
PRÆSIDE SOCIETATIS REG. SCIENT. GOETTING.
SODALI ACADD. REG. SCIENT. PARIS. REG. CHIR. GALL.
IMPER. BEROLIN. SUECIC. BONONIENS. ARCAD. BAVAR.
SOCIET. SCIENT. BRITANN. UPSAL. BOT. FLOR. BATAVIC.
HELVET. ŒCONOM. BERNENS.
IN SENATU SUPREMO BERNENSI DUCENTUMVIRO.

TOMUS OCTAVUS. (8)

INTESTINA. CHYLUS. URINA. SEMEN. MULIEBRIA.

EDITIO SECUNDA AUCTA ET EMENDATA.

LAUSANNÆ.
SUMPTIBUS SOCIETATIS TYPOGRAPHICÆ.

M. DCC. LXXVIII.

FIG. 2. The title-page of Volume 8 of Albrecht von Haller's monumental text. He was a major exponent of the preformation theory which was opposed by Wolff. (Courtesy John Crerar Library, Chicago.)

animal body is formed before the other; all are created at the same time."[61] He further affirmed that

> The ovary of an ancestress will contain not only her daughter, but also her granddaughter, her great-granddaughter, and her great-great-granddaughter, and if it is once proved that an ovary can contain many generations, there is no absurdity in saying that it contains them all.[62]

And he went on to compute that the ovaries of Mother Eve must have contained 200,000 million fully formed diminutive human beings.[63]

Meanwhile, Wolff had been pursuing his graduate work in embryology at Halle. Supplied only with his microscope, he approached chick embryology and plant anatomy with the courage to report only what he saw. His senses told him the current facile views of *emboîtement* could not be true. He failed to see preformed creatures, and searched about for a suitable alternative explanation. By the time he was ready to report the results of his observations, he was convinced that epigenesis was the answer.

As the *Theoria* took shape, he divided his subject into three parts: he first discussed plant development and reported that he had failed to find a series of encapsulated organisms; instead, he had discovered minute "globules" *(Bläschen)* which grew and differentiated into stems, leaves, and other plant tissues. He then applied the same method of observation and description to animal material, particularly the chick, with the same conclusions. In the final section he turned his attention to the theoretical considerations of epigenesis.[64,65]

Wolff averred that an organism starts its development from unorganized and undifferentiated material or primordium. A limb or branch, for example, first appears from this material, and gradually grows and becomes organized until the whole organism assumes its proper size and shape.

> In every living bud . . . and at every point where growth is taking place, one meets younger and smaller leaves wrapped up in older and larger ones. If one presses forward from the outside inwards, one meets at last the inner substance of the plant, which is moist and full of sap, and which no longer shows the protuberance *(Vorragungen)* of leaves.[66]

61 Hertwig, O. *The cell; outlines of general antomy and physiology.* New York, Macmillan and Co., 1895, 368 pp. (p. 336).
62 Mason, S. F. *Main currents of scientific thought.* New York, Henry Schuman, 1953. 520 pp. (p. 294).
63 Hertwig (note 61), p. 338.
64 Wheeler note 3).
65 Locy (note 39).
66 Wolff (note 13), Nr. 84, p. 27. Translation from Wightman (note 26), p. 380.

. . . leaves grow for the most part by new vesicles *(Bläschen)* pushing themselves between the old ones, to some extent also by the expansion of the vesicles.[67]

This process is controlled and guided by a unique force called *vis essentialis* (*wesentliche Kraft*), which is a non-material agency by which blood is caused to flow into long cavities lined by globules, liquid material solidifies, and urine is caused to flow through unorganized material which differentiates into the primitive kidney.[68]

By the 'essential force' *(vis essentialis)* liquids are collected from the surrounding earth, forced into the plant and spread into it, stored in some parts, . . . The chick embryo at the beginning of its development takes food from the egg substance. This absorption occurs by a force, which is not the contraction of the heart, the arteries or the pressure caused by them in neighboring veins nor their compression by muscular activity, . . .[69]

He seems to be discussing osmosis in this passage, a concept not really described with reasonable accuracy until 1826 by Dutrochet.[70,71] Three principles may be noted in these translations from the German version of the *Theoria:* (a) the completely unorganized primordium, (b) epigenesis, and (c) the *vis essentialis* acting as the causative agent.

Wolff never arrived at a fully developed formulation of vitalism, as did Aristotle and Stahl before him, or even Hans Driesch in more recent years. His *vis essentialis* has a decidedly immanent aspect in that it is a non-spatial force within the organism that vaguely guides it toward actuality. This view contrasts with the more transcendant and logical *entelechy* of Aristotle who wished thereby to harmonize the unchanging world of Platonic metaphysics with the changing world perceived by the senses.

He was also fond of contrasting plant and animal tissues. For example, he wrote that plant vessels were similar in function and origin to arteries. In this he was correctly anticipating the basic similarities in all living things later embodied in the cell theory.[72,73]

In the absence of a workable vocabulary, Wolff had to make up his own terms as he went along. In the section marked *Praemo-*

[67] *Ibid.*, p. 14. Translation from Wightman, *loc. cit.*

[68] Mason (note 62), p. 293.

[69] Wolff (note 13), Nr. 85, pp. 4, 5. Translation from Bodenheimer, F. S. *The history of biology: an introduction.* London, Wm. Dawson, 1958, 465 pp. (p. 309).

[70] Dutrochet, H. *L'agent immédiat du mouvement vital, dévoilé, dans sa nature et dans sa mode d'action, chez les végétaux et chez les animaux.* London, Paris [printed], J. B. Baillière, 1826, 226 pp.

[71] Rich, A. R. The place of R.-J.-H. Dutrochet in the development of the cell theory. *Bull. Johns Hopk. Hosp.*, 1926, *39*, 330-365.

[72] Mason (note 62), p. 295.

[73] Wolff (note 13), Nr. 85, sections 215, 216, pp. 29-33; section 271, pp. 59-63.

nenda of the 1774 edition of the *Theoria,* he noted that the blastoderm is composed of "spherules" or "globules": *"partes enim constitutivae, ex quibus omnes corporis animalis partes in primis initiis componuntur, sunt globuli . . ."*[74,75] Elsewhere he described how these globules (*Bläschen*) were arranged in *Blätter* or leaves. If he had substituted the term "cell" for "globule," and "germ layer" for "leaves," he would have come close to formulating the cell concept and the idea of germ layers, which he nevertheless foresaw.[76,77] Actually, the notion of "living tissue" had not improved appreciably since Aristotle's day; "tissue" was a sort of vague mixture of homogeneous and heterogeneous components with the old Greek ingredients of blood, phlegm, black bile, and yellow bile, corresponding to the elements of fire, air, earth, and water. This notion could not improve significantly until Theodor Schwann advanced his cell theory in 1839.[78,79]

The following passage from the *Theoria* really contains the essence of Wolff's argument for epigenesis.

> No one has ever yet, with the aid of a stronger lens, detected parts, which he could not perceive by means of a weaker magnification. These parts either have not been seen at all, or they have appeared of sufficient size. That parts may remain concealed on account of their infinitely small size and then gradually emerge, is a fable.[80]

In other words, when structures appear, they appear anew. They are not present in such small size that even the most powerful microscope cannot reveal them, Wolff says.

The *Theoria* alone could not prove epigenesis, nor was it Wolff's finer work. Nevertheless, it seemed to bring the entire issue involving epigenesis and preformation clearly to a focus in what became the celebrated controversy between Wolff and Haller, which occupied their correspondence for a number of years.[81–84]

74 Wolff (note 7), p. lviii.

75 Jenkinson, J. W. *Experimental embryology.* Oxford, Clarendon Press, 1909, 341 pp. (p. 16).

76 Garrison (note 55), p. 334.

77 Singer (note 51), p. 471.

78 Schwann, T. *Mikroskopische Untersuchungen über die Übereinstimmung in der Structur und dem Wachstum der Tiere und Pflanzen.* Berlin, Sander'sche Buchhandlung (G. E. Reimer), 1839, 117 pp.

79 Singer (note 51), p. 336.

80 Wolff (note 13) Nr. 85, Section 166, p. 3. Translation from Wheeler (note 3), p. 275, and Bodenheimer (note 69), pp. 308, 309.

81 Wolff (note 10), pp. 4, 5.

82 Wolff (note 7), p.v.

83 Kirchhoff (note 2), p. 197, *et passim.*

84 Cole, F. J. *Early theories of sexual generation.* Oxford, Clarendon Press, 1930, 230 pp. (pp. 146-149).

Haller's attitude in response to Wolff's claim was typical of an older man's indulgence of a young man's dream.[85,86] The opening lines of his review of the *Theoria* are a model of gentle forbearance:

> For a long time we have not read such an important book as that of C. F. Wolff of Berlin, who has defended epigenesis in a thesis at Halle, entitled *Theoria Generationis.*
>
> In the beginning nothing is in the leaf except many vesicles, and in the young root we recognize the same structure or a transparent one without seeing any vessels.
>
> In this entire process there is no need to assume any other basic force except movement the *vis essentialis,* and the thickening of the sap. With regard to the development of animals, one has to accept one principle only, namely that nothing exists except what can be seen. Everything in animals is composed of vesicles which are visible. Hence, we cannot accept, that invisible parts are present in addition. . .[87]

Although Wolff had presented a powerful argument for epigenesis, he nevertheless drew a wrong conclusion from his observations, namely, that transparency of a tissue indicates that no preformed structures exist. Haller already was at work on his own chick studies and felt it necessary to reply in detail to this kind of argument. However, he also came up with an erroneous conclusion:

> I have indeed seen many of the phenomena which he describes, and it is certain that the heart seems to be formed out of a congealed humour and that the whole animal appears to have the same consistency. . . . I have often given greater solidity to this jelly by the use merely of spirits of wine and by this means I saw that what had appeared to me to be a homogeneous jelly was composed of fibres, vessels, and viscera. . . . it is rather in the removal of transparency and the accession of greater firmness to the extremities, as well as the making of a more obvious boundary to the contour of a viscus that one could see the structure of a cellular tissue, ...[88]

In other words, Haller pointed out that he had rendered the transparent preformed structures visible by immersing the tissue in alcohol. In reality, the protein material had simply undergone coagulation when so treated. Both were wrong at this point, Wolff because he drew his conclusion with no experimental evidence, and Haller because he drew the wrong conclusion from his experimental data.

In his final thrust, Haller complained that Wolff's *vis essentialis* (*Causilität des Lebensprocesses*) did not, after all, explain the epigenetic mechanism, as though a better explanation should have

85 Friedell (note 59).
86 Kirchhoff (note 2), p. 210 *et passim.*
87 Wolff (note 7), pp. xxxviii, xxxix, xli. Translation from Bodenheimer (note 69), pp. 310, 311.
88 Needham (note 38), pp. 201, 202.

been given. He thereby laid his finger on what remains today one of the most intriguing enigmas of developmental biology.

> Finally, to cut a long story short, why does this *'vis essentialis,'* which is one only, form always and in the same places the parts of an animal which are so different, and always upon the same model, if inorganic matter is susceptible of changes and is capable of taking all sorts of forms? Why should the material coming from a hen always give rise to a chicken, and that from a peacock give rise to a peacock? . . . To these questions no answer is given.[89]

Meanwhile, Wolff had transferred to St. Petersburg. There he considerably improved his laboratory technique and rapidly matured to the magnitude of the problem he was attempting to solve. The issue seemed to turn on the origin and development of the small intestine. Haller, on observing the intimate connection of yolk with the chick embryo in the gut area, had erroneously concluded that the embryo had always been there.[90,91] He conceived the embryo as a sort of hernia of the yolk, thus confusing continuity of tissue with contemporaneity. As he began his observations, Wolff felt there were essentially two simple alternative views concerning this problem. Either it should be possible to see all the parts of the intestine fully formed, or it should be possible to observe a series of changes, shapes, and folds occurring during formation of the intestine.

Thus Wolff condensed the controversy into the ideal scientific situation. He so refined the problem that he could set before himself two mutually exclusive alternatives, only one of which could be demonstrably true. There have been scientific discoveries of greater moment than his, but in being able to reduce the issue to simple alternatives he achieved the elegance that surely characterizes a first-rate production.

In 1769 Wolff presented his second set of arguments in what is considered to be his better and more sophisticated work, the *De formatione intestinorum*. With unerring acumen he advanced his most telling arguments for epigenesis with his accurate account of gut formation.[92]

Wolff insisted that Haller was mistaken in affirming that the blastoderm occurred preformed in the unfertilized egg, claiming rather that it was an altogether new structure. Indeed, if one had

89 *Ibid.*, p. 202.
90 *Ibid.*, p. 221.
91 Wolff (note 7), pp. lxi *et passim*.
92 Locy, W. A. *The growth of biology*. New York, Henry Holt and Co., 1925, 481 pp. (pp. 231-234).

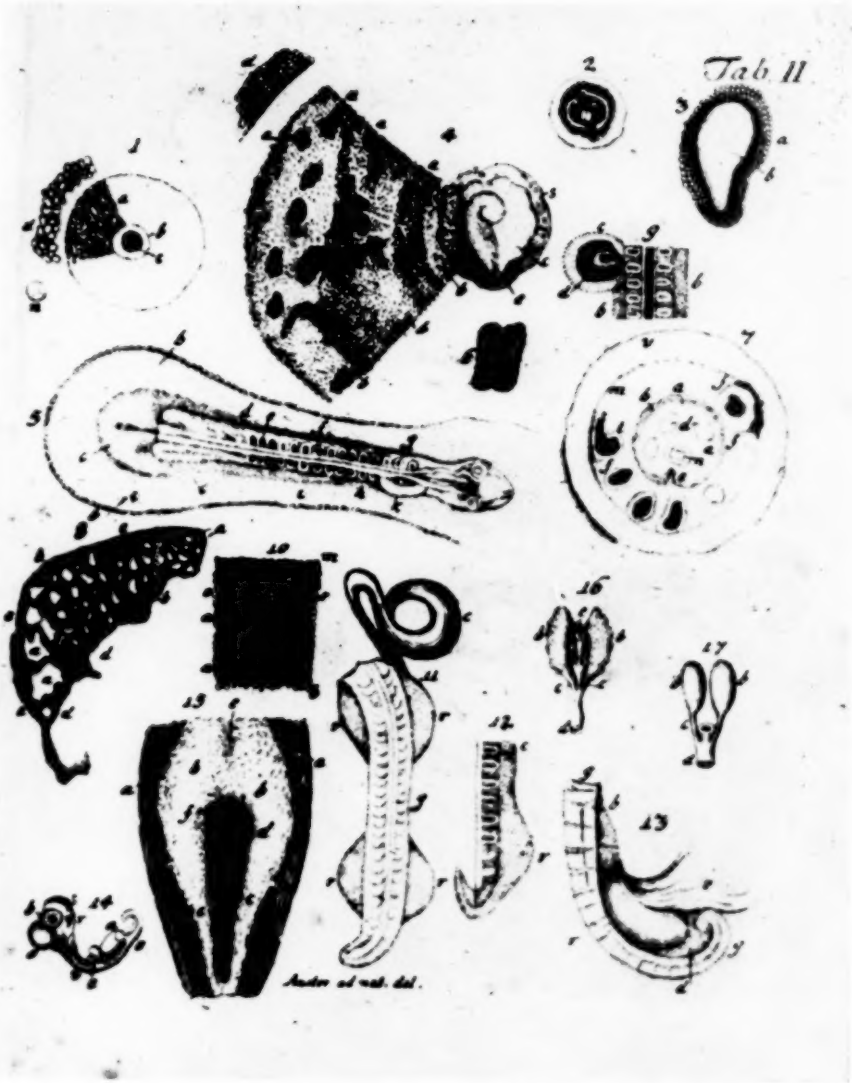


FIG. 3. Wolff's earlier drawings of chick embryology prepared in medical school for his dissertation. Primitive staining techniques probably precluded his distinguishing nuclei in the cells, which he called "globuli." These drawings are a microscopic survey of the incubated egg. (1) The unincubated egg; its natural size, n; cells or "globuli," as Wolff drew them; (2) the 28-hour incubated egg, as seen with the naked eye; (5) the 36-hour chick, showing developing medulla, h; vertebrae, f; rudimentary lumbar vertebrae, d; area pellucida, c; (11) spinal vertebrae with rudimentary extremities, from the 96-hour embryo; (14) the embryo preserved in alcohol as seen by the naked eye, but with somewhat more detail added, showing occipital lobe of cerebri, o; optic lobes, b; extremities, e; abdomen, a. This is the second plate from his dissertation. (Courtesy National Library of Medicine.)

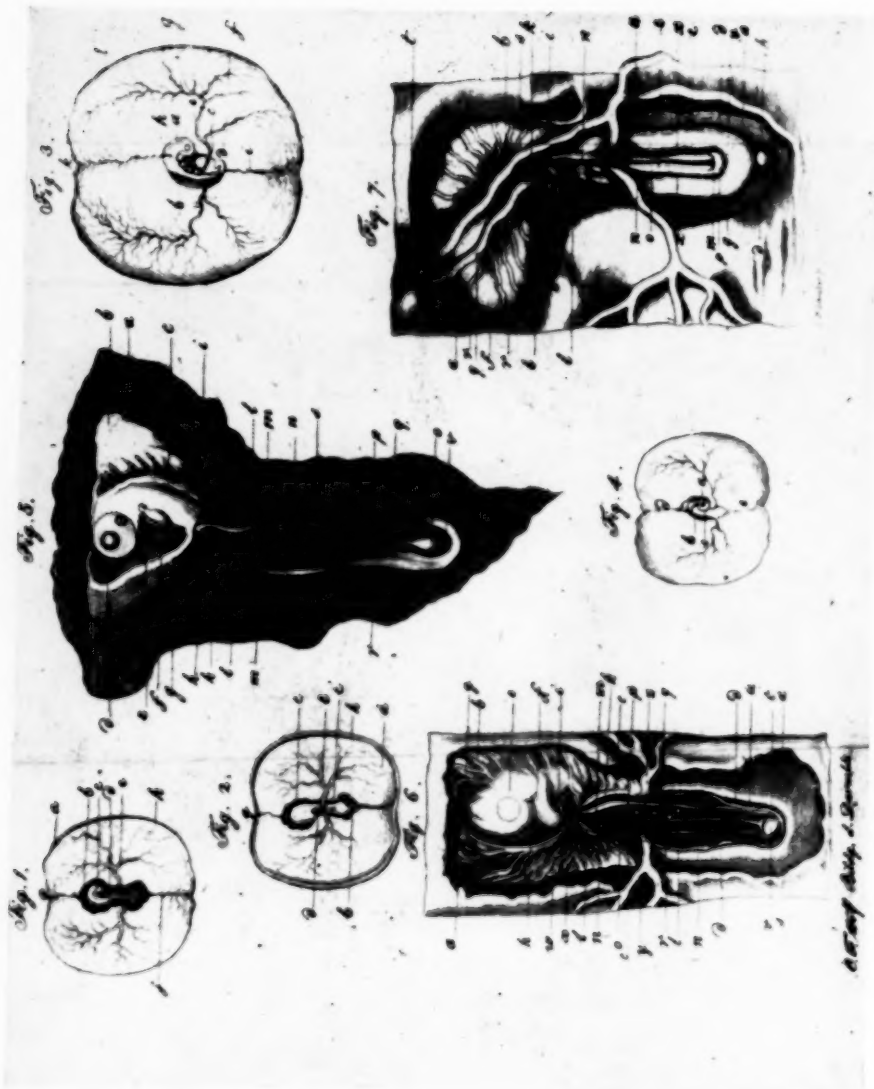


FIG. 4. Wolff's later drawings of chick embryology, showing a great improvement in technique. The drawings were originally done on copper plate.

(1) The area vasculosa (*der Gefäfsraum*) and area pellucida (*die durchsichtige Stelle*) surrounding the 3-day embryo, showing developing omphalomesenteric arteries and veins (*die absteigende* and *aufsteigende Vene*), e, f, g; (2) the chorion, or "false amnion," as Wolff called it, c; (3) the area of yolk in which the 3½-day embryo is developing, b; the stem of the vitelline vein (*Stämme der Dottervenen*), c; extra-embryonic blood vessels (*Mittlers Aestchen*), f, g, l; (5) area pellucida with 54-hour embryo, showing first rudiments of the perceptible amnion, f; swelling edge of the gut, i; sinus rhomboidalis (*Ende der Wirbelsäule*), c; spinal cord (*Rückenmark*), q; traces of the reticular formation (*Spuren netzförmiger*), preceding formation of blood vessels, or blood islands, s; (7) intact chorion (*unversehrtes falsches Amnion*), a; chasm between abdomen and developing gut, o; branches of the vitelline arteries and veins, q, u.

These drawings first appeared in Wolff's 1768 work on the development of the intestine. See footnote 8. A later admirer of Wolff was Johan Friedrich Meckel who made translations from the Latin. In 1812 he brought out a German edition with the title, *Über die Bildung des Darmkanals im bebrüteten Hühnchen*, in which these drawings form the *Erste Tafel*. See footnote 12. (Courtesy John Crerar Library, Chicago.)

suggested to Haller that the problem could be solved by simply having a look, he probably would have replied with unassailable logic that this would be of no avail, since the blastoderm is transparent. If the intestine were really pre-formed as Haller maintained, Wolff reasoned that it should grow larger before one's eyes.[93] One would see it completely formed as soon as it could be found under the microscope. However, Wolff found that the intestines, heart, and other organs actually developed, by foldings, indentations, ridge formations, and fusions. Rather than accept Haller's view of intestinal preformation in the blastoderm, Wolff chose to trace morphogenesis for himself.

> The intestine of the chicken embryo is first a simple membrane. . . . This longitudinal stripe of the double plate, first plane, begins to swell into a cylindric shape and then resembles the primitive intestine. We are thus certain, that this intestine is a new formation and that it could not have existed as such before and just now only have been unwrapped. . . . No doubt remains with regard to the truth of epigenesis.[94]

In this statement Wolff declared that the intestine was actually formed by the folding of two parallel sets of tissues which detached themselves from the ventral surface of the embryo, forming a sort of gutter, which then drew together to form a closed tube. Over a century later Wilhelm His was to describe embryological processes in similar language[95,96] It is not out of place at this juncture to suggest something that both Wolff and His probably missed. These foldings, flexions, and fusions are not the cause of morphogenesis but rather are an accompaniment of it.

Wolff struck a further significant blow at preformation with his description of Wolffian bodies, or the *mesonephros,* whose usefulness in vertebrates is confined to the embryonic period. Here were temporary excretory structures (*Anlagen der Nieren*) that gradually appeared out of his primordium and after a short interval of such activity became absorbed or were transformed into nonfunctional tissue.[97] He also noticed that haemopoetic islands appeared in the extra-embryonic mesoderm before there was any functional connection with the heart.[98,99,100]

93 Mason (note 62), p. 294.
94 Bodenheimer (note 69), p. 309.
95 His, W. On the principles of animal morphology. *Proc. roy. Soc. Edinb.*, 1888, *15*, 287-298.
96 His, W. *Unsere Körperform und das physiologische Problem ihrer Entstehung.* Leipzig, F. C. W. Vogel, 1874, 224 pp.
97 Wolff (note 13), Nr. 2, pp. 34, 41, 42, 45, 91.
98 *Ibid.*, sections 196-216, pp. 18-29.
99 Mason (note 62), p. 294.
100 Locy (note 39), p. 213.

Aristotelian epigenesis thoroughly pervaded Wolff's outlook and conditioned his method, making it easier for him to see what was actually there. He had the freshness so characteristic of originality and genius and that trait so necessary for a truly scientific advance in thought: the uncanny ability to look beyond what others see and to state one's findings in a simple generalization. At the same time there was a certain *naïveté* in his approach as he tried to apprehend the complexity of developmental processes in terms of his *vis essentialis,* thus relating himself rather closely with that *bête noir* of biology, vitalism.

In a passage taken from his *De intestinorum formatione praecipue,* Wolff's original, mildly animistic *vis essentialis* no longer seems important. He gives a classic definition of epigenesis:

> This is one of the most important proofs of epigenesis. We may conclude from it that the organs of the body have not always existed, but have been formed successively: no matter how this information has been brought about. I do not say that it has been brought about by a combination of particles, by a kind of fermentation, through mechanical causes, through the activity of the soul, but only that it has been brought about.[101]

V

Wolff's ideas were largely ignored. Twelve years after the *Theoria,* the philosophical Charles Bonnet wrote:

> Cette hypothèse de l'emboîtement est une des plus belles victoires que l'entendement pur ait remporté sur les sens. Les calcules effrayans par lesquels on contreprend de la combattre, prouvent seulement qu'on peut toujours ajouter des zéros à des unités, et accabler l'imagination sous le poids des nombres.[102–104]

Neither the exquisite descriptive work of Malpighi nor Wolff's own logic could budge him from his stand.[105] On the other hand, probably Goethe and Kant were familiar with Wolff's writings, which were certainly the most lucid exposition of epigenesis in the 18th century. Wolff clearly anticipated the morphological principles later expanded by Goethe. Kant also supported epigenesis with his *Critique of Judgment* published in 1790:

101 Wolff (note 12), p. 245, Wolff (note 8), 1769, *13,* 519. Translation from Wheeler (note 3), pp. 275-276.

102 Bonnet, C. *Oeuvres d'histoires naturelle et de philosophie.* Neuchâtel, Samuel Fauche, 1779-1783, 8 vols. (vol. 4, Contemplation de la nature, pt. 8, p. 270).

103 Needham (note 38), pp. 213, 214.

104 Oppenheimer (note 42), p. 6.

105 Whitman (note 36).

> . . . even supposing we failed to see the enormous advantage on the side of the advocate of *epigenesis* in the matter of empirical evidence in support of his theory, still reason would antecedently be strongly prepossessed in favor of his line of explanation. For as regards things the possibility of whose origin can only be represented to the mind according to a causality of ends, epigenesis none the less regards nature as at least productive in respect of the continuation of the process, and not as merely unravelling something.[106]

All three thinkers, Wolff, Goethe, and Kant, belong to the romantic tradition that was later expressed in the transcendental biology in Germany by Lorenz Oken,[107] in France by Geoffroy St. Hilaire,[108] and in England by Sir Richard Owen.[109] This movement, however, with its roots in Platonic idealism, soon became outmoded.[110, 111]

VI

The doctrine of epigenesis in its simplicity has made possible new insights into development, although continuing complexity is thereby revealed. The doctrine of preformation as expressed by the complexity of *emboîtement* rendered new insights and studies superfluous by insisting that organisms were already formed, as Wolff complained.[112]

When he finished his treatise Wolff could have had no idea that two hundred years later the problems he discussed would still not be completely solved—*Präformation oder Epigenese*.[113] Still less could he have imagined that an eminent twentieth century embryologist would pay tribute to his work and that of Haller as "the greatest between Malpighi and von Baer."[114] However, if he had foreseen that his *Theoria* would become a classic in embryology he doubtless would have taken greater pains with his drawings. They are fairly good for a beginner in biology, but they hardly do for a graduate student (Figure 3). They display neither the clear definition of detail one quickly notices in Malpighi's work, nor the artis-

106 Kant, I. *The critique of judgment*, 1790. J. C. Meredith, Tr. Oxford, Clarendon Press, 1952, Appendix to Part 2, p. 85.

107 Oken, L. *Elements of physiophilosophy*. London, Ray Society, 1847, 665 pp.

108 Geoffrey Saint-Hilaire, Isidore. *Vie, travaux et doctrine scientifique d'Étienne Geoffroy Saint-Hilaire*. Paris, P. Bertrand, 1847, 479 pp.

109 Owen, Sir R. *On the anatomy of vertebrates*. London, Longmans, Green and Co., 1866-1868, 3 vols.

110 Wightman (note 26).

111 Mason (note 62), p. 295.

112 Wolff (note 1), p. 5; (note 7), p. xxix.

113 Hertwig, O. *The biological problem of today: preformation or epigenesis*. New York, Macmillan Co., 1896, 148 pp.

114 Needham (note 38), p. 193.

tic achievement of Vesalius. There is a great improvement, however, in his 1769 publication (Figure 4).

There are three faulty emphases in Wolff's theory: (a) his *a priori* denial of all organic structure in the egg, that was not revealed by his observations, (b) his undue comparison of plant and animal tissues, and (c) his vitalism.

Caspar Friedrich Wolff perceived that a living organism is an event in time. It expresses the continual stream of matter and energy that passes through it and yet constitutes its biological essence. Moreover, the organism proceeds epigenetically toward a specific goal that can be glimpsed in its chemical preformation. Indeed, it is being learned that information governing much of the epigenetic process is somehow codified in DNA. These two notions were once thought to be negations of each other. Together they are guideposts toward a wider appreciation of development: chemical preformation, to which biology may turn more and more, and the ancient insight of epigenesis, which the Psalmist may have dimly perceived.

ACKNOWLEDGMENTS

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Modern Surgery and Lord Lister

IRVING I. EDGAR*

JOSEPH Lister was born 5 April 1827, at Upton, Essex, England, the fourth child of Joseph Jackson Lister, who had achieved fame in the field of optics through improvements in the microscope, for which he was elected Fellow of the Royal Society. Lister was raised in a strict Quaker atmosphere, and his boyhood education was received at the Quaker schools in Hitchin and Totenham. At an early age he became interested in science and particularly in surgery. So strong was his love for surgery that at sixteen he began studies in anatomy.

In 1847 Lister received the degree of Bachelor of Arts from the University of London and in 1852 produced his first original work. He demonstrated for the first time the presence of dilator and sphincter muscles in the iris of the eye and, a short time later, proved the presence of the muscle fibers connected with the hair and skin. He was elected a Fellow of the Royal College of Surgeons and was granted the degree of Bachelor of Medicine in the same year. In 1853 Lister did some original experimental work on the flow of lacteal fluid in the mesentery of the mouse, making new observations and contributing new facts. It was not, however, until Lister became house surgeon at University College Hospital that he began the work which was to be of such inestimable value to surgery and of such importance to mankind in general.

When Joseph Lister entered upon his career, surgery was in a deplorable state. While the scope and usefulness of surgery remained at the point where Ambroise Paré had left it, the increase of hospitals through charitable donations created a new spectre of death. They named this spectre "hospitalism" but it was nothing more than suppuration; that is, bacterial infection. Hospital gangrene, pyemia, septicemia, erysipelas, tetanus, puerpural fever—these were the great foes of the surgeons. They made the decision of a surgeon to operate equivalent almost to the signing of a patient's death warrant. They made hospitals hotbeds of pollution and disease, making the very name hospital a terror to the hearts of patients about to enter.

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The introduction of anaesthesia was a great boon to surgery and to the surgeon, for it relieved the patient of pain and allowed the surgeon to work more slowly and with greater steadiness and ease. But anaesthesia, blessing though it was, effected its own defeat. More operations were undertaken with the result that there was more hospital gangrene, more pyemia, more septicemia.

The ravages of hospitalism were frightful. The mortality was enormous. In the Krankenhaus at Munich, 80 per cent of the wounds became affected with gangrene. A mere pin prick was a door to death, and every patient suffering from a wound was to be regarded with anxiety.

Amputations formed the greater portion of surgery and amputations were resorted to in all compound fractures, for compound fractures were then almost always fatal. The mortality from these amputations was staggering. Sir John Erichsen of University College Hospital in his booklet *On hospitalism and the Causes of Death after Operations*[1] gives the following statistics:

At the Paris hospitals, the mortality following amputations was 60 per cent, at the Edinburgh Infirmary, 43 per cent, at the Glasgow Infirmary, 39 per cent, and at the Pennsylvania Hospital between 1851 and 1860, 24.3 per cent. Out of 692 amputations at the Massachusetts General Hospital, there were 180 deaths—a mortality of 26 per cent. Billroth at Zürich between 1860 and 1865 did 163 amputations with 75 deaths—a 46 per cent mortality. Nussbaum of Munich, Volkmann of Halle, Thiersch of Leipsig, Bardeleben of Berlin, Saxtorph of Copenhagen, and numerous others, all reported mortality rates similar to the ones above. The surgeon was powerless to cope with the situation. He was actually placed in a position where he had to discourage patients from entering hospitals and from having operations. In fact, the cry arose among eminent surgeons to demolish all hospitals. The Allgemeines Krankenhaus in Nuremberg was completely torn down, and the Lincoln County Hospital was ordered razed by its Governors. Sir James Y. Simpson after making a study of hospitalism showed that in Edinburgh, London, and Glasgow hospitals, out of 2,089 amputations, there were 855 deaths, 40 out of every 100, while out of 2,098 amputations in country practice there were 226 deaths, only 11 in every 100.[2] "The man laid on the operating table in one

1 London, Longmans, Green & Co., 1874. Quoted also in: Godlee, Sir R. J. *Lord Lister.* London, Macmillan & Co., Ltd., 1918, p. 131.

2Libby, Walter. *The history of medicine.* Boston & New York, Houghton Mifflin Co., 1922, p. 342.

of our surgical hospitals, is exposed to more chances of death than the English soldier on the field of Waterloo," thundered Simpson in his advocacy of the destruction of all hospitals.

John Bell, supporting Simpson, gives the following account of hospitalism in his *Principles of Surgery*:[3]

> There is no hospital, however, small, airy, or well regulated, where this epidemic ulcer is not found at times; and then no operation dare be performed, every cure stands still, every wound becomes a sore, and every sore is apt to run into gangrene; but in great hospitals especially it prevails at all times, and is a real gangrene; it had been named the 'hospital gangrene'; and such were its ravages in the Hôtel Dieu of Paris (that great storehouse of corruption and disease) that the surgeons did not dare to call it by its true name; they called it the rottenness, foulness, and sloughing of the sore; the word 'hospital gangrene' they durst not pronounce, for it sounded like a death-knell; at the hearing of that ominous word the patients gave themselves up for lost. In the Hôtel Dieu this gangrene raged without intermission for two hundred years, . . .
>
> [Further he states] Men, women, and children were turned by it into a foul but living putridity, until death at last got rid of the life that was a burden to itself and a source of offence and loathing to its neighbors. This was the worst disease of the many terrible diseases that were the gift of man's charity to man. It was the gift which the Hôtel Dieu, the House of God, dispensed to all who sought or were forced into its charitable wards, so that no less than twenty-five out of every hundred who entered living were borne out dead.

Military surgery was in an even worse plight.[4] Wounds killed more men than bullets. In the American Civil War the Union armies had 67,058 men killed in battle and 43,012 men killed by wounds. Out of 2,818 cases of pyemia, 974 in every thousand died. Of the amputations at the hip, 89.3 per cent proved fatal. The mortality in ligations of the femoral was 75 per cent; of trephinings, 61 per cent.

In the Crimean War the situation was yet worse.[5] Of the 460 amputations done by the British, 40 out of every 100 were fatal. The French reported 7,607 killed in battle and 8,813 killed by wounds and the consequent suppuration. Of the amputations, 67.4 per cent proved fatal. In disarticulations of the hip joint, the mortality was 100 per cent and the same was true of amputations through the thigh.

The lesson of antisepsis was not even learned in the Franco-Prussian War. According to the report of the Inspector-General of

[3] Bell, John. *Principles of surgery*. New York, Collins & Co., 1812, p. 25. Quoted from Wrench, G. T. *Lord Lister*. New York, F. A. Stokes Co., 1913, pp. 72-77.

[4] Keen, W. W. *Papers and addresses*. Philadelphia, G. W. Jacobs & Co., 1923, pp. 167-175.

[5] *Ibid.*

France, Dr. J. C. Chenu, out of 13,173 amputations there were 10,006 deaths.[6] Ninety out of every 100 amputations in Paris proved fatal. In German surgical hospitals Stromeyer reported 34 amputations through the knee joint with 34 deaths, and Nussbaum reported 36 amputations with 36 deaths.[7]

The greatest foe in battle was not the bullet but suppuration, not the attack of the enemy but the attack of the microbe. And too often the surgeon instead of being a deliverer from death and pain was in reality an executioner, transferring from one patient to another the seeds of suppuration and death.

Joseph Lister entered upon his career as surgeon with these conditions staring him in the face. And watching the ravages of suppuration on every side, he resolved in his heart to devote his life to its conquest. "The main object of my life is to find out how to procure this result [healing, without suppuration] in all wounds," said Lister to Sir John Batty Duke in 1854. We shall see how this was accomplished.

At University College Hospital and later under Syme at Edinburgh, where he had greater freedom and greater opportunities, and still later as Regius Professor at Glasgow (1860), Lister laid the foundations of the new surgery. He set himself to work, to observe, to experiment. Both at the Edinburgh Infirmary and the Glasgow Infirmary, hospitalism, gangrene, pyemia, septicemia, erysipelas, tetanus were the terror of surgeons and surgery. Lister attempted to institute ordinary cleanliness in his wards, the frequent use of soap and water. He improved the sanitary conditions of these places. He attempted every form of wound treatment. He tried the *open treatment,* in use by some surgeons, of not approximating the edges of wounds. This allowed the free escape of discharge but made healing tedious and did not do away with suppuration. He tried the *occlusion method* prevalent in Edinburgh of sealing wounds with collodion. But this allowed no drainage, and the results were no better than the open method. He tried water dressings, poultices, irrigations, water baths, but all to no avail. He soon realized that he was working in the dark. He must know the nature of suppuration before he could successfully attack it. He must bring the foe into the open. In 1856 Lister began experiments on coagulation of the blood and by 1863 he had developed the theory of coagulation: that blood coagulates when

[6] Libby, *op. cit.,* p. 348.
[7] Keen, *op. cit.,* p. 175.

it comes in contact with any foreign matter and with injured tissue. But this was only the first step. Soon he began his studies and experiments on inflammation and suppuration, and these occupied the rest of his life. In an early paper on hospital gangrene, Lister recognized that this dread disease was due to the "impure state of the atmosphere produced by overcrowding of patients with decomposing sores," and "that foul discharges from sores were the predisposing cause and the exciting cause," rather than the oxygen of the atmosphere as then believed. In 1861 he went a little further—he began to teach that the occurrence of suppuration in a wound was determined by the influence of decomposition, and, in 1867, that the essential cause of suppuration is decomposition. Whether in the wards of the infirmary or in his lecture rooms, or in his bed at night, the problem occupied his mind. Together with the vision of the dead and the dying and the suppurating rotten flesh, there kept hammering in Lister's brain, Why does a simple fracture heal and a compound fracture prove almost always fatal? Why do caustics sometimes prevent suppurations? Why is the mortality greater in hospitals than in private homes? Why suppuration? Why suppuration? Looking through the microscope for endless hours noticing the constant presence of certain bodies, no doubt bacteria, Lister wrote, "I imagined they might be the materies morbi in the form of some kind of fungus." Thus in Lister's mind there began to dawn the concept of the parasitic nature of disease.

He who finds the cause and nature of fermentation and decomposition will find the cause of suppuration and disease. Thus taught Robert Boyle and also Cagniard-Latour. And thus taught Lord Lister.

Pasteur's Influence

Pasteur had shown that fermentation and decomposition are due to living organisms, that disease is due to living micro-organisms. He saved the wine and silk industries of France; but he did more than that. To Lister, he revealed the missing link in his chain of discoveries, and Lister immediately recognized and grasped its significance. At last he would set before the world the cause of suppuration!

If suppuration is due to living organisms, then the immediate problem at hand was to kill these micro-organisms without injuring the living tissues, or better still, to prevent micro-organisms from entering the tissues. The germ theory became the cornerstone of Lister's work. The problem now was clear cut:

1. Suppuration is a form of decomposition or putrefaction.
2. Living micro-organisms cause decomposition.
3. Micro-organisms cause suppuration.
4. These micro-organisms are present everywhere.
5. The way to prevent decomposition and suppuration is to destroy the causal micro-organisms.

Lister set himself to work to find a method of excluding germs from wounds and, more important than this, of killing germs present in wounds. Three ways of approach presented themselves: (1) heat kills germs; (2) filtering removes germs; (3) certain chemicals destroy germs. Lister chose the last method as the most practicable. Writing in the *British Medical Journal,* Lister said, "It occurred to me that decomposition in the injured part might be avoided without excluding air by applying as a dressing some material capable of destroying the life of the floating particles." And so he set about to find a suitable antiseptic.

Nature had supplied antiseptics for the use of man from time immemorial, and man has always used such antiseptics blindly and in ignorance, not grasping their miracle-working powers. The preservation of meats by smoking and salting is an old antiseptic procedure. The use of honey and wax by Egyptian embalmers was another antiseptic procedure. Wine and vinegar have also been antiseptics used by man and actually applied to wounds. Thus Celsus sponged all wounds with wine and vinegar. Boiling oil and turpentine were in use by most surgeons following amputations. Even some of the coal tar products were used before the time of Lister. Semmelweis practised antisepsis in Vienna by the frequent washing of hands and the free use of chlorinated lime, and he reduced the mortality in the maternity hospital from 15 per cent to 1.27 per cent in two years. But his work lacked the scientific foundation and, martyred by his own profession, he and his work were forgotten.

In 1834 Runge discovered carbolic acid.[8] Alphonse Guerin, Bottini, and Lemaire,[9] who wrote a book on carbolic acid, made use of this powerful antiseptic in their surgery. But they did not succeed, for they did not know what they were striving for.

In 1865, having completed some studies on inflammation and suppuration, having accepted the bacteriological cause of suppuration, and having cast about for a suitable antiseptic, Lister read of the wonderful results obtained in the city of Carlisle through the

[8] Godlee, *op. cit.*, p. 158.
[9] *De l'acide phénique.* Paris, 1863.

use of creosote in the disinfection of sewage. He immediately obtained some creosote and began experiments with this substance. In the same year he used pure phenol in a case of compound fracture. The treatment was unsuccessful, and the patient died. This might have discouraged a lesser man from trying further, but so strongly did Lister believe in his principle that he did not give up. In 1866 he treated another case of compound fracture, and this time success crowned his efforts. Writing to his father on 27 May 1871, he said: "Thus a most dangerous accident seems to have been entirely deprived of its dangerous element." A new era had been ushered in for surgery—Lister severed the bonds that held it within limits and hence forward it was to know real freedom.

II

At the Glasgow Infirmary, instead of amputating all limbs with severe compound fractures, Lister instituted the full application of carbolic acid. Out of 13 cases of compound fractures with severe contusions and lacerations, only 2 were fatal. One developed gangrene, necessitating amputation, and one developed gangrene not requiring amputation. The remaining seven cases recovered as though they were simple fractures. Here, then, was unheard-of success. Lister had obtained results never obtained before. Fortified and encouraged by these results, he instituted a new regime in his wards at the Glasgow Infirmary and began the application of his principle of antisepsis to different fields of surgery. First of all, he improved the sanitary and hygenic conditions by greater cleanliness and more ventilation. He further insisted that dressers, assistants, and nurses make frequent use of soap and water and carbolic acid before passing from one patient to another, and that wounds be kept wet with carbolic. He demanded isolation of suppurative cases. Under such a regimen the healthiness of Lister's wards showed striking improvements. He applied the antiseptic principle in the use of various strengths of carbolic acid to the treatment of acute abscesses, carbuncles, boils, whitlows, and ordinary wounds. The results were remarkable.

Next, Lister extended his principle to the treatment of "cold abscesses" of tuberculous origin. Such conditions had always been resistant to treatment, particularly psoas abscesses which almost always led to death; and incision only invited suppuration and hastened the demise of the patient. Nevertheless, with the aid of a solution of carbolic acid Lister decided to incise such abscesses in

the groin. Here, too, unheard-of success followed, and, after several months of care, his patients entirely recovered and the sinuses closed. Writing to his father on 24 February 1867, he said: "There are two patients now in the hospital, rapidly gaining flesh and strength, who, without this plan would very probably have died, and another left a few days since quite healed for whom the same may be said."

In 1867 Lister published in the *Lancet*, "Papers on a New Method of Treating Compound Fracture, Abscess, etc., with Observations on the Condition of Suppuration." With the publication of the remarkable results he had obtained with carbolic acid, he excited much attention, particularly on the continent.

THE METHOD

1. After cleansing the broken limb and squeezing out the clots of blood, Lister introduced into the wound a piece of lint soaked in undiluted carbolic acid. He passed this freely in all directions.
2. Then another piece of lint soaked in phenol was applied over the wound overlapping ½ inch in each direction.
3. Over this he laid a block of tin or sheet lead to prevent evaporation of the phenol.
4. The dressing was fixed with adhesive.
5. Carbolic was applied from time to time by removing the plate.
6. A tenacious crust formed over the wound, healing taking place by scabbing and without suppuration.

For incision of abscesses he practised the following:

1. He purefied the area by application of carbolized oil 1-4.
2. He sterilized instruments by allowing them to remain in carbolized oil for varying periods.
3. He made the incision, evacuated the pus.
4. He applied some form of carbolic acid as a dressing.

In the course of these studies also he brought to light new pathological facts, the most important of which are:

1. That an antiseptic clot which had once contained carbolic acid, could, if undisturbed, be organized into living tissue by the growth into its substance of cells and vessels from surrounding parts.
2. That even a piece of dead bone may be absorbed in antiseptic wounds by the granulations lying in contact with it. The only necessary thing was the exclusion of germs or the destruction of germs.

With the application of the principle of antisepsis in the Glasgow Infirmary, Lister had worked a miracle. Whereas before the application of antisepsis the Infirmary was full of hospital gangrene and pyemia, after its application these diseases disappeared, and Lister was able to write:

> But since the antiseptic treatment has been brought into full operation, and wounds and abscesses no longer poison the atmosphere with putrid exhalations, my wards, though in other respects under precisely the same circumstances as before, have completely changed their character; so that during the last nine months, not a single instance of Pyemia, hospital gangrene, or Erysipelas has occurred in them.

And to his father he wrote: "I now perform an operation for the removal of a tumor, etc., with a totally different feeling from what I used to have. . . . In fact, surgery is becoming a different thing altogether."[11]

Lister soon found that pure carbolic acid was too strong. He therefore experimented with various solutions and strengths. In his search for antiseptic dressings, he experimented with almost every salt in the pharmacopeia. He was always ready to vary the practice of antisepsis, though the principle remained the same. From pure carbolic acid, Lister changed to an aqueous 1-20 solution and 1-40 solution. He then used oily solutions of carbolic, 1-4. As dressings, he first used materials which did not absorb discharges. Thus carbolized putty was followed by the cerate dressing which was a mixture of paraffin, olive oil, and carbolic acid spread on calico. This was replaced by shellac mixed with phenol 4-1, only to be discarded for the "lac plaster"—corrosive sublimate, serosublimate gauze, and the double cyanide of mercury and zinc. Boric acid and numerous other substances were used in his attempt to find an antiseptic deadly to micro-organisms and yet nonirritating to the tissues. Finally, Lister began to use dressings intentionally devised to absorb discharges.

Having conquered suppuration, Lister began to enlarge the field of surgery and to apply the principle of antisepsis to surgical wounds. He insisted that operator and assistants scrub hands with soap and water and dip them frequently in a solution of carbolic acid. Instruments were to be immersed in carbolic acid for 20 minutes before operation. The area of operation was to be scrubbed with soap and water and sterilized with a solution of carbolic acid, and towels wrung in carbolic acid were to surround the area of operation. So careful and thorough was Lister in carrying out the principle of antisepsis, that he even introduced the carbolic spray which filled the atmosphere with a solution of carbolic acid, much to the discomfort of all present. Experience and further investigation greatly changed his practices, but the principle of antisepsis remained.

[10] Godlee, *op. cit.*, p. 198.
[11] *Ibid.*

In 1867, Lister entered the ankle-joint to straighten a foot made useless by an accident. And in 1868, he entered the knee-joint to remove a piece of cartilage, procedures formerly always fatal and therefore rarely attempted. But Lister was successful. Thus he wrote to his father, "I removed it [loose cartilage in knee-joint!] by a free incision into the knee-joint: A thing I should not have thought of doing without the antiseptic system."[12] This operation gave birth to orthopedic surgery. Lister had demonstrated that the surgeon could operate on the osseous system, providing the principle of antisepsis was strictly adhered to.

Nor did he stop here. Emboldened by his successes, he entered still other fields of surgery. He began to do abdominal operations. And here, too, the principle of antisepsis triumphed. Sir Spencer Wells and Keith, though using scrupulous cleanliness in ovariotomy, obtained a 30 per cent mortality, but with the application of antisepsis, this was cut down to 5 per cent.[13] Thus was the abdomen brought within the range of surgery.

The principle of antisepsis is a fundamental one and through its application new fields of surgery were possible. In obstetrics, where Semmelweis had failed to impress the profession and where the mortality in childbirth was enormous, Lister succeeded and childbirth was made safe. Gynecology, plastic surgery, thoracic surgery all owe their existence to Lister and antisepsis.

In 1867 he turned his attention to hemostasis in aseptic wounds. Since the time of Ambroise Paré, who introduced the ligature for tying blood vessels, non-absorbable ligatures and sutures had been used, particularly metal wires, and these ligatures were left hanging out of the wound several inches. This not only invited suppuration, but in the process of sloughing it also brought about secondary hemorrhage. Surgeons had tried other materials for ligating vessels, even catgut, but without antisepsis, suppuration always ensued. Lister had observed in his pathological studies, however, that antiseptic clots could be absorbed and organized by the living tissue, and that even dead bone could be absorbed provided no suppuration was present. Then why could not an absorbable substance, properly and antiseptically prepared, be used for ligating blood vessels? Or why even could not such ligatures be cut short? On 12 December 1867, Lister tied the carotid artery of a horse with a piece of unwaxed silk which had previously been

12 See Wrench, *op. cit.*, p. 278.
13 Godlee, *op. cit.*, p. 122.

steeped for some time in a saturated aqueous solution of phenol. He cut the ligature short and closed the wound. Healing took place by first intention. Six weeks later, the horse died a natural death, and Lister dissected down the ligated carotid. He found the silk unchanged but bridged over externally by fibrous tissue. Soon after, an opportunity presented itself and he ligated an external iliac artery for femoral aneurism in a woman 51 years old. The ligature was silk steeped in carbolic acid for two hours. All went well. The ligatures were cut short, healing took place, and the patient recovered. Thus it was demonstrated that, with the use of the antiseptic system, ligatures antiseptically prepared could be cut short and left within the wound.

Lister next tied the carotid artery of a calf in two places with catgut prepared from the peritoneal covering of the intestines of an ox, and also from the submucous coat. Both ligatures were seasoned and steeped in phenol for four hours. A month later the calf was killed, and Lister found that the ligatures had been absorbed and that fibrous tissue had replaced them. Thus was the absorbable ligature introduced successfully into surgery. Lister made endless experiments to perfect catgut—time of absorption, seasoning, strength, size, asepsis, all these factors had to be considered. He finally devised a method for preparing catgut still in use today.

All over the world Lister had instilled new hope. Everywhere on the continent surgeons instituted antisepsis. Students came from far and wide to learn his methods. Dr. Saxtorph, Professor of Surgery at the University of Copenhagen and Head Surgeon of Fredriks Hospital, visited Lister. He returned to Copenhagen, adopted his plan of antisepsis, and in one year was able to write: "Not a single case of Pyemia has occurred since I came home last year . . . owing to the introduction of the antiseptic treatment. . . . All the compound fractures . . . have healed without the least suppuration, . . . all the amputations have recovered."[14]

In 1869 Syme, Professor of Clinical Surgery at Edinburgh and Lister's father-in-law, died, and Lister was appointed to take his place, that of Surgeon at the Royal Infirmary at Edinburgh. Here too he produced a striking transformation, for the Edinburgh Infirmary had had no better record than the Glasgow Infirmary. Hospital diseases were rampant and the mortality from amputations appalling.

[14] Wrench, *op. cit.*, pp. 161-162.

For nine months after Lister's introduction of antisepsis not a single case of pyemia occurred and not a single case of gangrene.

At the Munich State Hospital where Nussbaum was Chief Surgeon, the transformation brought about by antisepsis was particularly striking. At this hospital as many as 80 out of 100 were killed or crippled by hospital gangrene, and the foul stench of suppuration filled the wards. Nussbaum was in despair and thought seriously of demolishing the hospital, but he grabbed at the last straw and introduced the antiseptic system. Soon he was able to say, "this discovery of Lister's has worked wonders." Gangrene had vanished from his wards.

At Halle, von Volkmann was also able to report the value of antisepsis. Previous to the introductions of antisepsis, conditions there were no better than at Munich, and it was proposed that the hospital be closed. After the introduction of antisepsis, out of 75 patients suffering from compound fractures, there was not a single case of hospital disease, and all the patients recovered as though they had simple fractures. Out of 139 amputations, 4 died, and only a short time before, the mortality was 20 to 30 times this figure. In wounds of joints, there was not a single death. Volkmann, fortified by antisepsis, dared new operations never attempted before, with amazing success.

Thiersch repeated the story at the Leipzig hospital. So terrible were conditions there that the hospital was actually abandoned and a new one built. But soon even in the new hospital the dread diseases began to work their ravages. The introduction of Listerism, however, had the desired effect and "the terrors of the past have been totally abolished."

Bardeleben of Berlin, Lucas-Championnière Von Busch of Bonn, Hagedorn of Magdeburg, Langenbeck of Paris—all of these and numerous others worked the miracle in their wards. From France, Austria, Italy, Scandinavia came reports of the success of antisepsis.

Lister had provided surgeons with a weapon with which to combat hospital diseases and had proved its efficacy by his remarkable results; but his countrymen, instead of giving antisepsis a fair trial, were only too ready to discredit it. First of all, the majority of surgeons did not believe in the germ theory. And, not believing in the germ theory, they could not properly understand the principle of antisepsis. Lister repeated the convincing experiments of Pasteur and devised ingenious experiments of his own—experiments

which definitely proved the bacterial origin of putrefaction, fermentation, and suppuration. He showed that milk received in sterilized glasses in a sterile way and covered by sterile tops remained sweet for an indefinite period, while milk exposed to the air soured—a most striking evidence of the presence of bacteria in the air. He did the same with urine, being able to keep urine from putrefying for years. Nevertheless, Lister was called a dreamer, and Dr. Hughes Bennet, Professor of Physiology in Edinburgh and an authority on microscopy, called germs "imaginary."[15] Sir James Simpson particularly opposed Lister, using his ironic eloquence to ridicule him, calling his bacteria "mythical fungi," and discrediting his discoveries by showing that carbolic acid had been used before. Sir James Paget of St. Bartholomew's Hospital called Lister's practices "useless."[16] Others called antisepsis "meddlesome." Lister's opponents would not understand and they lost sight of the great principle that he was propounding, referring to his practices as the "carbolic treatment," the "carbolized putty treatment," the "lac plaster treatment," and so on. They made fun of the belief that ligatures could be absorbed and might be cut short in the wound. In fact, in 1869 at Leeds, where a meeting of the British Medical Association took place, Mr. Nunneley, who was chosen to give the leading address in surgery, spent his entire address discrediting antisepsis, the germ theory, and Lister, stating the theory of antisepsis was absurd and "a positive injury."[17] Lister's methods were considered "a return to the dark days of Surgery."

But so high-minded and serene, so single in purpose was Lister, that he did not allow himself to be drawn into useless controversies, nor to indulge in personalities. Wherever possible, he clearly, distinctly, and precisely reiterated his principle. He published the results of his experiments and practices, allowing the readers to use their own judgment.

At last, especially among the younger surgeons, there arose voices in Lister's defence. Thus Bickersteth of the Royal Infirmary at Liverpool declared antisepsis "an immense step toward the perfection of our art."[18] Creswell, senior surgeon to the Dowlais Iron Works in Wales, applied Lister's principles and methods to industrial injuries. After a year's trial, Creswell was able to say: "The use of carbolic acid in the treatment of wounds and compound

15 The atmospheric germ theory. *Edinb. med. J.*, 1868, *13*, 816.
16 Wrench, *op. cit.*, p. 192.
17 *Ibid.*, p. 193.
18 Godlee, *op. cit.*, p. 327.

fractures has created quite a revolution in the surgical practice of the Dowlais Iron Works."[19] Gradually voices from Scotland and Ireland and the Provinces, some weak, some strong, made themselves heard in favor of antisepsis. Those who took the trouble to visit his wards could not help but become staunch disciples of Listerism. Sir Watson Cheyne, Joseph Bell, Mr. Berkeley Hill of University College Hospital, Lund of Manchester, Aberdeen of Glasgow, Teale, Keith, Annandale, Duncan, John Brown, Lichtenberg, and numerous others came to the master to study his methods and were converted to antisepsis.

The Franco-Prussian War came, and Lister published a pamphlet on the antiseptic treatment of wounded soldiers, but neither France nor Germany paid it the attention it deserved and so the lesson of the Crimean War went for naught. It was not until the Russo-Japanese War that the principles of antisepsis were applied in military surgery by the Japanese. It was not bullets that won this war for them, but the proper use of antisepsis. Before battle the sailors and soldiers were ordered to take antiseptic baths and to put on clean clothing. Wounds were treated with antiseptics. The results were the absence of the dreaded hospital diseases and the lowering of the mortality after amputations. Out of 173,425 wounded, 11,500 died (6.1 per cent mortality).

In 1877, Lister was appointed Professor of Surgery at King's College Hospital to give antisepsis a trial. He entered the knee-joint to wire a fractured patella, a procedure previously fraught with danger and rarely attempted by surgeons. The operation was successful. Lister removed a large, malignant tumor of the thigh in a patient abandoned by other surgeons. Again he was successful; no suppuration occurred. Sir James Paget and Sir Prescott Herriett, then President of the Royal College of Surgeons, had refused to operate on a patient with a large tumor of the scapula because of the risk of suppuration in the large wound which would be left. Lister removed the tumor in the presence of these surgeons. No suppuration occurred, and the patient recovered without pain or fever. Professor Wood, also of King's College Hospital, was to compare the results in his wards using no antisepsis with the results in Lister's wards. Convinced by Lister's successes he invited him to teach him his methods of antisepsis. Professor Wood operated on a patient with goitre, Lister assisting and supervising the antisepsis.

19 Wrench, *op. cit.*, p. 186.

The patient recovered and no suppuration ensued. Gradually all opposition to antisepsis waned and died.

Lister's final triumph came in 1879 when, at the International Congress of Medical Science held at Amsterdam, he was acclaimed with enthusiasm by surgeons from all over the world. Even in London, at a meeting held at St. Thomas's Hospital for the purpose of discussing antisepsis, surgeons who had formerly opposed Lister and antisepsis expressed their regrets at their blindness and openly accepted antisepsis as a most important part of surgery. Sir Alexander Ogston in 1883 wrote to Lister: "You have changed surgery, especially operative surgery, from being a hazardous lottery, into a safe and soundly based science. You are the leader of the modern generation of scientific surgeons."[20] Oliver Pemberton of Birmingham wrote: "I know you have caused more lives to be saved in the hospitals . . . than ever yet were saved by surgery." And Saxtorph said "I may say that the antiseptic treatment has . . . completely changed my . . . surgical practice. The word "hospitalism" no longer terrifies us, it no longer keeps us from performing operations in the infirmary and you seldom meet with a case . . . of hospital disease."[21] The world had accepted antisepsis.

From the year 1877 until his death, Lister was showered with honors from all over the world. His tours through Europe were triumphal marches, and in every city where he stopped he was accorded tremendous ovations and shown the utmost reverence and gratitude. Numerous university degrees were bestowed upon him, medals were awarded him, medical societies all over the world made him an honorary member. He was made a Knight of the Prussian Order, a Knight Commander of the Order of Denmark, and a peer of England.

On 10 February 1912 Lord Lister died and on 16 February he was honored with a national memorial service at Westminster Abbey. He was buried by the side of his wife in Hampstead Cemetery.

Many years have passed since the acceptance of the principles of antisepsis. Lister raised surgery from a lottery, a game of chance and a craft, to a safe scientific art and science. He changed it from a rough and ready emergency measure to precise, steady, reliable, and sure surgery—from a procedure of destruction to one of construction. He removed the obstacle limiting surgery to a small

[20] Godlee, *op. cit.*, p. 328.
[21] *Collected papers*, vol. II, p. 247. Quoted also in Godlee, *op. cit.*, p. 352.

sphere of application and made only the skill and dexterity of surgeons its real limits. Numerous types of surgery—abdominal, cranial, thoracic, orthopedic, plastic, etc., and all the surgery yet to come—owe their existence to Lord Lister. Whereas surgery was rarely used in the past, and then only as a last resort, today it forms an important part of every speciality, as may easily be gathered by a comparison of hospital statistics of the mid-19th century and today.

The present hospital system exists because of Lister, for without antisepsis hospitals were houses of torture and death, and their demolition might well have taken place, as advocated by the most eminent surgeons. Lord Lister's discoveries came providentially, giving hospitals all over the world a new lease on life and making them houses of healing and cure.

Lord Lister vanquished hospitalism, so that the dread diseases grouped under this name are rarely met with today. Thus at University College Hospital, London, there were only two cases of hospital gangrene in 40 years after the introduction of antisepsis. And pyemia, septicemia, and tetanus were only occasionally encountered.

Because the principle of antisepsis which Lord Lister introduced is a broad, fundamental one, it has found application in every field of the healing art, particularly in obstetrics. Where Semmelweis and Holmes failed, Lister succeeded, and the act that ushers in new life rarely takes away the life that gives it birth. Preventive medicine, which is in the main the application of antisepsis, really began when Lister introduced his great principles. The treatment of our water supply, the preservation of foods, and numerous other important procedures necessary to our present civilization all draw on the principles of antisepsis, and, as time goes on, these principles have found widening spheres of usefulness and have been of ever greater benefit to mankind. Such is Lister's beneficent gift.

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Public Health at the Privy Council 1831-34*

FRASER BROCKINGTON**

CHOLERA has often been cited as the true force behind public health legislation of the 19th century. What really happened during its first visitation? Was any effective machinery produced? Did this last? How did the machinery differ, if at all, from the Boards of Health, which, for many centuries, had been almost the automatic response to any threat from the great killing diseases—particularly the plague—in many of the European cities, since the 14th century, limited in scope and generally in time, with insufficient powers and little money, frenzied in action for short periods followed by torpor? We have also to ask ourselves how the cholera scare of 1831 differed from the plague scare of 1720, when Dr. Richard Mead reported to the Government in his treatise on the plague, recommending a Central Board of Health, which like the plague itself did not materialise; or from the Gibraltar sickness scare of 1805, when a Central Board was established.

The cholera approached Britain slowly across the northern plains of Europe. Having appeared in epidemic form at Jessore, one hundred miles northeast of Calcutta in August 1817, it spread quickly in India itself; but outside it rarely covered more than five miles a day.[1] It spread southward to Mauritius and Timor, eastward to Peking, north to Siberia and Astrakhan, and west to Moscow. It reached Astrakhan in 1823, Moscow in 1830, Yaroslav, Rybinsk, and Archangel in 1831; it was in St. Petersburg on 23 June 1831.

* The records upon which this report are mainly based were in the Privy Council Offices, Whitehall, London S.W.1, and subsequently removed to the Public Record Office, Chancery Lane, London W.C.2, where they are listed as follows:

P.C. 1/93-113
H.O. 31/17
P.C. 1/2660-2662
P.C. 1/4395.

The following have been photographed or microfilmed and can be seen at the Department of Social and Preventive Medicine, The University of Manchester.

P.C. 1/96 (Memorial only)
P.C. 1/102
P.C. 1/105
P.C. 1/4395 Part I
Orders in Council 21 June, 14 Nov., 13 Dec. 1831; 29 Feb., 6 March, and 19 July 1832)
Supplement to the London Gazette, 21 June 1831
Rules and Regulation, 20 November 1831.

** Department of Social and Preventive Medicine, University of Manchester, England.

1 Pettigrew, T. J. *Observations on cholera: comprising a description of epidemic cholera in India, the mode of treatment and the means of prevention.* London, Highley, 1831.

On 17 June Drs. William Russell and David Barry were instructed to proceed to Riga with the object of studying the disease at first hand. The clinical features of cholera were calculated to alarm. Its sudden onset and fatal effects filled the hearts of high and low alike with awe; stories everywhere told of the way it struck in the poorer quarters, where squalor, overcrowding, lack of ventilation, filth, and intemperance seemed to beckon it on. There was thus ample time and every incentive both to establish a public health organisation and also to begin the long and uphill task of sanitary progress.

In accordance with the practice established in 1805, at the time of the Gibraltar Sickness, the Government resolved to establish a Board of Health at the Royal College of Physicians. In a letter of the Clerk of the Privy Council, C. C. Greville (18 June 1831) to the President of the College, Sir Henry Halford, a request was made for names of Fellows of the College who could be recommended to serve on the Board and one who might act as its Secretary. The hope was expressed that the Board meetings might be held at the apartments of the College.[2]

A Central Board of Health[3] was established by Royal proclamation on 21 June 1831.[4] It consisted of the President (Sir Henry Halford) and five Fellows (Drs. Holland, Maton, Turner, Warren, and Macmichael) of the Royal College of Physicians; together with Sir Thomas Byam Martin, Comptroller of His Majesty's Navy; Hon. Edward Stewart, Deputy Chairman of Board of Customs; Sir James MacGregor, Director-General of Army Hospitals; Sir William Burnet, Commissioner of the Victualling Office; Sir William Pym, Superintendent-General of Quarantine; with Dr. Seymour, Fellow of the Royal College of Physicians, as its Secretary.[5] This Board of eminent men is what the *Lancet* called the courtier Board of Physicians—drones, sycophants, and courtiers, titled imbecility; "*not one of whom,*" it said, "*has ever had personal experience in the treatment of the disease*"[6]—a charge which seems hardly to have been justified.

This Board sat almost daily at the Royal College of Physicians from 21 June until 11 November 1831. If we are to believe the

2 Return to an Address to His Majesty, 24 June 1831 (P.C. 1/4395 Part I).

3 The term used by John Simon in *English sanitary institutions* (p. 169) was consultative Board of Health. The Minute Book is, however, entitled *Central Board of Health.*

4 Supplement to the London Gazette of 21 June 1831.

5 Order in Council, 21 June, P.C. 1/4395.

6 *Lancet,* 1831, 2, 433.

Lancet in the following passage, the members of the Board enjoyed a salary of £500 per annum: "Thus twelve gentlemen are to receive £6,000 a year for protecting the public from the contagion of cholera, while it is probable that not two of those gentlemen are agreed upon the point, whether the disease is infectious or not; . . ."

At its first meeting, at 9:00 p.m. in the evening, the Secretary read out instructions from the Privy Council as to how they should conduct their business. Three, with two medical members, were to make a quorum; their Lordships wished to know what, if any, modifications should be made to the Rules and Regulations of Quarantine dated 19 June 1825; what general regulations were required for separating sick from well and for permitting only such intercourse as might be free from danger of spreading the infection; and what measures were needed for assistance and relief to the afflicted and for preventing spread; was the disease now prevailing in Russia communicable from person to person and could it be communicated by inanimate matter of any description. In a further letter of 4 July two further questions were posed: How long a time persons coming from infected ports should be detained in quarantine; what liability certain goods had to retain infection and to what degree and species of expurgation goods should be submitted.[7]

Of the five instructions of the original Minute, the fourth and most significant in terms of development of public health said:—

> That the Board of Health do prepare such Rules and Regulations as they may deem most effectual for the adoption of the most approved method of guarding against the cholera. . . and do transmit the same for the consideration of the Lords of His Majesty's Most Honourable Privy Council.

A subcommittee consisting of Sir William Burnet, Drs. Warren and Macmichael was appointed to draft the rules and regulations. And that was the beginning—perhaps the true beginning—of the sort of public health that represents the sanitary ideal through local government for which this country has been noted and which has influenced a large part of the globe.

Within a week (29 June) the Board had transmitted to their Lordships a draft of its proposed rules and regulations, as follows:

> As there are strong reasons for believing that the disease called Cholera Morbus now prevailing in Russia and the North of Europe is infectious, it is of the utmost importance that the very first cases that appear should be known as early as possible and that concealment of the sick should be guarded against. With this view it is submitted, that in every Town or

[7] P.C. 1/101.

Village commencing with those on the Coast there should be established a local Board of Health to consist of the Chief Magistrate and Clergymen, one or more of the Professional Gentlemen and Principal Inhabitants. One of the medical members to be appointed to correspond with the Board of Health in London. Every Town under such circumstances should be immediately divided into Districts, having a district Committee of two or three members, one of them of the Medical Profession to watch over its health and to give the earliest information to the Board of Health of the Town whose instructions they will carry into effect.

In each Town or its Neighbourhood one or more Places to be immediately pointed out as places to which every case of the Disease as soon as detected might be removed in conveyances appropriated exclusively for the purpose. For the higher classes who can pay for their accommodation houses to be hired in airy and detached Situations under the Control of the Magistrates.

The Houses from which the Sick Persons have been removed should be purified in the following manner. The wearing apparel and household furniture should be thoroughly washed and scoured, the walls and ceilings lime washed, the doors and windows of each apartment left open for many days.

The Occupiers of each House where the Disease may occur or be supposed to have occurred to report to the District Committee of Health in order that the Professional Member may immediately visit, report, and if necessary cause the patient to be removed to the place alloted for the sick. The names and residences of each of the Members of the District Committee of Health to be fixed on the doors of the Church or other conspicuous place.

Further and more detailed instructions and likewise description of the disease called Cholera Morbus will be transmitted hereafter.

The Board submitted also a list of names of medical practitioners to whom they suggested that the Lords of the Privy Council should communicate the Rules and Regulations, and who might be relied upon to supply the earliest news of infection.

The suggestion for a nation-wide system of public health went beyond anything that had gone before. It gave rise in the end to about 1,200 local boards of health in the United Kingdom of which 822 were in England and Wales and about 400 in Scotland,[8] all being formally constituted by orders in Council. But for two months the Central Board awaited a reply from the Clerk of the Privy Council. At intervals the Minutes[9] expressed concern that the Rules and Regulations, submitted so promptly, had not been approved for general circulation. The Royal Proclamation had specifically referred to a set of Rules and Regulations, which the Central Board was 'to prepare and digest.' In the general state of

8 P.C. 1/102.
9 P.C. 1/101.

alarm, letters asking for these came from a large number of widely scattered places: Barmouth, Bristol, Devon, Gloucester, Hull, Lancaster, Manchester, Newcastle-upon-Tyne, North Shields, Rochester, Shrewsbury, Sunderland.

The reasons for delay are not far to seek. The proposal to establish local boards of health on a wide scale was certainly novel; but the real difficulty lay in the suggestions made for coercion which were strongly expressed in the latter part of their draft. The strength of this view was given in a further letter to the Privy Council (11 July 1831) which read in part:

> . . . To carry into execution the Regulations transmitted by the Board to the Privy Council dated June 29th it will be necessary that the local Boards of Health in every Town or Village engage persons according to the emergency to be called 'Expurgators.' The fewer the number of Persons employed on this duty the better, as thus the chance of spreading the infection by their means will be diminished.
>
> As the progress of infection may be almost entirely prevented in any Town, if the first case of disease is immediately detected, separated from the healthy and treated early, a reward of not less than pounds, at the discretion of the magistrate, should be offered for the detection of cases and a penalty of not less than pounds to be levied as a punishment for concealment. As soon as it is reported to the local Board of Health that a case of infectious Cholera has really been detected, some of the Expurgators, should be forthwith directed to proceed to the house where the disease exists. They should take with them the carriages and conveyances appropriate to this use and immediately remove the sick to a temporary residence, previously pointed out to serve the purpose of a Lazaretto. Those who have been in immediate communication with the sick must be considered as suspected and should be removed at the same time to another residence appointed for the suspected in Conveyances not used for the sick and special care should be taken that these persons who are only suspected should have no further communication whatever with the sick or the expurgators. . . . etc.
>
> In this removal police officers or military should be on duty to prevent any approach to the Expurgators, the Sick, or the Suspected, or to the Carriages in which the Sick are conveyed to the Lazaretto.

Such rigour accorded ill with the growth of democratic ideals on the eve of the Reform year.

Thus it was not until 8 August 1831 that the Privy Council gave reluctant agreement to circulation of such parts of the Rules and Regulations as the Board might think necessary 'provided they are not contrary to law.' It stressed, however, the lack of authority of the Lords of the Council to give orders until the plague was actually in Great Britain.

The *Lancet* of 3 September[10] published a letter from Sir Henry

[10] *Lancet*, 1831, 2, 727.

Halford which gave the gist of his proposals (29 June and 11 July 1831). There was no reference to powers for the professional member to 'cause the patient to be removed,' nor to expurgators.

It may seem strange to us now that a publication of important national proposals should first appear in a medical journal prior to an official statement in the *London Gazette,* and at a time when the Lords of the Privy Council were still deliberating upon the propriety of the proposals. But in fact the Privy Council was concerned with *official machinery,* i.e., one which would be subject to direction from the Centre; local arrangements including the establishment of local Boards of Health independent of the central government had for long been a matter for local decision. Thus the Board of Health at Manchester, in which Percival and Ferriar had been the moving spirits, appeared in 1794. There is little doubt that local boards of this unofficial character were already forming at this time. On 27 June 1831 the Physician's Board, within the first two weeks of its existence, had received a letter from Newcastle which said: "We beg to inform you that a Board of Health, consisting of the magistrates, medical gentlemen and others, has been established in this town."[11]

The *Lancet* took exception to Sir Henry Halford's announcement.

> It is really a scandalous insult; indeed it amounts to a violation of an almost sacred trust, or if this latter charge be not admitted, it must be received as a proof of ignorance far beyond what we could have supposed to exist, even amongst a body of persons consisting of Fellows of the Royal College of Physicians in London. Ye powers! The 'local Boards' of Health are to be composed of 'the chief magistrate, the clergymen, two or three of the most respectable inhabitants, and *one or more of the medical men* (sic) . . . as a kind of ballast or make-weight.
>
> If twelve clergymen had been formed into a metropolitan commission for the purpose of conducting some ecclesiastical transaction in the provinces, would these twelve *clergymen,* in advising the appointment of 'local' commissions, have recommended that they should consist of the chief magistrate, the physician, *one or more* clergymen and two or three of the principal inhabitants.[12]

This was part of the war between physicians and general practitioners; but it also represented an early distrust of lay interference on the part of the doctors.

With the publication of Sir Henry Halford's letter in the *Lancet,* "medical gentlemen" in all or most of the danger areas

11 P.C. 1/4395 Part I.
12 1831, 2, 820.

began to press for local action. On 4 October Dr. Blewett wrote from St. Mary's, Scilly, to say that a local board of health had been formed in these islands "consisting of the lieut. governor, the magistrates, the collector and controller of the customs, with the clergyman" and himself.[13]

During the months of June to November, the Physicians Board did all they could to fulfil the duties placed upon them; in addition to the Rules and Regulations, quickly framed, they were concerned to answer the vital questions of infectivity (of both humans and materials) and quarantine. On 9 June, prior to the formation of the Board, the Privy Council had written to Sir Henry Halford calling attention to the urgent need to know more of the danger of infection being transmitted by humans or material and asking that the Royal College of Physicians should advise. To this Sir Henry had replied on the same day, saying, "I did not lose a moment in calling to my assistance the physicians, who have signed the enclosed statement. . . ." The recommendation was for a quarantine of 14 days for both humans and materials.[14]

Current opinion was strongly in favour of contagion; but it had particular difficulty in accounting for the irregular and spasmodic nature of the spread. As William Ferguson (1791-1881) said in "Letters on Cholera Morbus:"[15]

> No one, unless he can take it upon him to find the true nature of this evil, malignant cholera morbus, can be warranted utterly to deny the existence of contagion, but he may at the least be permitted to say, that if contagion do exist at all, it must be the weakest in its powers of diffusion, and the safest to approach of any that had yet been known amongst diseases. Amateur physicians from the continent, and from every part of the United Kingdom, eager and keen for cholera, and more numerous than the patients themselves, beset and surrounded the city of Sunderland with all the fearless, self-exposing zeal of the missionary character, yet no one could contrive, even [in] the foulest dens of that seaboard, to produce the disease in his own person, or to carry it in his saturated clothing to the healthier quarters of the town where he himself had his lodgings.

Dr. Thomas Walker wrote to Mr. Greville in similar terms from St. Petersburg (17/29 April 1831):

> I myself am *convinced* of the contagious nature of the disease but the *proofs* of its transmission from one individual to another are not quite perfect as yet. And believing so, I cannot, of course, be without some apprehension that it may also be conveyed by clothes and other articles, which have been in more immediate contact with the sick, although the proofs

[13] P.C. 1/4395 Part I.
[14] Return to an Address to His Majesty 24 June 1831, P.C. 1/4395 Part I.
[15] 9/2/1831 Windsor.

of this are, as yet, still more defective. It is a disease *"sui generis"* and must have its own laws, as well as the plague, typhus fever, and other contagious or infectious disorders, but these laws we do not yet sufficiently know.[16]

After this, every effort was made to throw further light on the obscurities of the nature of the infective process, the means to disinfect materials, and the possibilities of preventing infection from person to person. In particular, the use of chlorine gas as a disinfectant was carefully explored following a letter of 4 July from Earl Grey to the Lord President of the Council, which called attention to methods proposed by Dr. Andrew Ure for disinfecting goods on board ships. On 21 July a subcommittee was established to study the evidence for the disinfecting properties of chlorine gas. Mr. Fenchum appeared before the Committee to answer questions and subsequently began experiments at Greenwich; Mr. Faraday[17] was examined (27 June 1831); there was correspondence with Dr. Gregory and Dr. Gilbert Blane about chlorine gas in the smallpox hospital and with Dr. Richard Bright in respect to disinfection in Guy's Hospital (19 July).

Mr. Greville frequently asked for news of their deliberations and encouraged the Board to continue with experiments. Writing in this vein on 27 June 1831 he suggested "that it might be desirable to try them upon a larger scale than has hitherto been attempted and particularly in the mode prescribed by Mr. Fenchum." The Board replied that a "satisfactory investigation of this process" would take so much time that any immediate action in applying chlorine as a disinfectant could not be contemplated. As a result of six months' work, the Board concluded that the gas could not be used to check the spread of contagion from person to person; but it was reasonably certain that it would disinfect materials, and this in dilutions that gave rise to no harmful effect upon them. Unfortunately there was no evidence, they said, that materials were involved in the transmission of cholera.

The final entry in the Minute Book of the first Board of Health (17 November)—that is after it had reverted presumably to a committee of physicians—records the results of a controlled experiment undertaken in conjunction with Mr. Faraday; in this seven persons who were inoculated with smallpox material after it had been exposed to chlorine gas in dilutions of one in fifty, one in seventy-five and one in a hundred, remained unaffected; all seven people

16 P.C. 1/4395 Part I.
17 This presumably is Michael Faraday. No record exists of his precise testimony.

subsequently "had the disease in the most perfect and regular manner when vaccinated late."

The Board was also asked (4 July 1831) to examine practitioners who had had practical experience with cholera. It took evidence from eminent people, consulted the literature, and prepared an authoritative account of the disease, its symptoms, treatment, and precautionary measures to guide medical practitioners (12 August 1831).

On 12 October, the Board re-submitted its "Code of Regulations"; they were basically the same as to the machinery but made no mention of forcible removal. The Privy Council was now acutely aware of the imminence of cholera which had arrived in Hamburg, separated from this island by no more than the width of the North Sea. Everyone was galvanised into action. October 20th is a date to be feted by the world's army of health administrators so long as health administration continues, for it achieved almost the impossible in administrative sleight of hand. In the morning their Lordships of the Privy Council met; the Secretary then acknowledged the communication received from the Physician's Board dated 12 October and commented that the report appeared to embrace two points connected with the subject which were of the greatest importance, namely:

> a caution to the authorities in the country and the inhabitants of the coast especially in respect of the introduction of the disorder into the country by means of clandestine intercourse with the opposite shores of the Continent and the establishment of Boards of Surveillance and district Committees to watch over the health of the inhabitants, and adopt every possible means of preventing the spread of the disease should it unfortunately be introduced.

But the report appeared to be defective in one main point which should be supplied in any document to be given such an extensive circulation: it was wanting in "some particulars of the early symptoms of the cholera and of the remedies ..."

This letter was read by Sir Henry Halford to the Board at 4.30 p.m. The Board immediately adjourned to re-assemble at 10.30 p.m., by which time the supplement asked for had been prepared; it was read to the meeting and agreed upon, sent forthwith from Pall Mall to Whitehall, received by the Secretary of the Privy Council, and despatched to the printers. The Rules and Regulations, embellished with an additional statement about Cholera, appeared in the *London Gazette* of the same date (20 October).

On 27 October 1831 James Butler Kell, Surgeon 82nd Regt., had the melancholic task, as he said, of reporting the death from cholera of an inhabitant of Sunderland. The time had come to ensure that the rules and regulations, so tardily promulgated, had the most serious attention. On 31 October, Lord Melbourne wrote as follows to all police magistrates:[18]

I feel it to be my duty to call your immediate and earnest attention to the Rules and Regulations proposed by the Board of Health for the purpose of preventing the introduction and spreading of the disease called Cholera Morbus and ordered by a Committee of the Lords of the Privy Council to be printed and published in the Gazette of the 20th instant and to be circulated throughout the United Kingdom.

It will be incumbent upon you in the first instance to take into your consideration those measures which are recommended, not only as necessary in case of the actual breaking out of the disease, but as useful for its prevention, namely the formation of Parochial Boards acting voluntarily and gratuitously; the division of Parishes, increased cleanliness, better drainage, and freer ventilation both of Streets and Houses and you will make to me a confidential report upon these matters and all others of the character above described which are contained in the Rules and Regulations, after a full and careful consideration of the local situations, the amount and description of the population and all the circumstances of the district in which you act. In forming your judgment you will naturally be led to consult the Parochial Authorities and the intelligent inhabitants, who will without doubt be willing and anxious to render you every assistance, and you will state to me your opinion as to how far it may be practicable to carry into execution such precautionary measures, and how they may be adopted in the most effectual manner—you will also apply yourself to the consideration of those Regulations, which are proposed by the Board of Health to be enforced in case of the actual appearance of the disease, and which in such an event, would probably be enjoined by the Authority of the Privy Council under the Order of George IV, Chapter 78, Section 6. You will carefully deliberate upon the measures by which the observation of such Rules may be secured in the manner the most efficient their purpose, and at the same time with the least interruption to the ordinary business of Society and the least shock to the feelings of the People. You will take care to make particular enquiry, and to give the most satisfactory information you can obtain, as to the means afforded within your district of providing places of reception for those who may be attacked by the disease, but at the same time you will take especial care that in making the preliminary investigations solely with a view to future contingencies, no unnecessary expense whatsoever is incurred, or authorised to be incurred. I feel confident that you cannot otherwise than be strongly impressed with the necessity of acting in the discharge of this duty with the utmost caution and circumspection and of studiously avoiding any act or expression which may by possibility excite unnecessary apprehension or give rise to rumours of an alarming character.

I am yours, etc.

(signed) MELBOURNE.[19]

18 P.C. 1/107.
19 P.C. 1/107.

On the following day, 1 November, the Board received notice from the Board of Health in Sunderland that "Within these few days four deaths from spasmodic or continental cholera have occurred in the Town of Sunderland." On 4 November the Board wrote officially to the Clerk of the Privy Council to announce with the deepest regret the melancholy fact that "The Board is justified in expressing a belief that the disease has actually occurred in the country"; and that it had "every mark of the true spasmodic cholera." They wrote by the same post and in the same terms to the City of London which was in daily communication by sea with the Tyne ports.

Whatever may have been done in forming local boards of health as a result of local initiative before and after Sir Henry Halford's letter in the *Lancet*, after the Order in Council of 20 October, no doubt greatly influenced by Melbourne's letter to magistrates, the number of areas which adopted the expedient of forming local boards of health increased greatly. Thus we read that in the City of Exeter[20] after the document had been affixed on 23 October 1831 in the most public places throughout the City . . . *"The historic horrors of the ancient plague were recalled to memory, and all became busied in the gloomy anticipation of the future."* By the solicitation of the Mayor, a meeting of the magistrates and physicians of the city took place at the Guildhall on 27 October at which the following Resolutions were adopted.

I. That in the opinion of this meeting a Board of Health should be immediately appointed in the city, pursuant to the recommendation enclosed therein.

II. That the city should subsequently be divided into districts, corresponding with the quarters or wards of this city and county.

III. That the physicians, now present, be desired to consult the other members of their profession as to the arrangements necessary to be made on this subject, and to request the attendance of a deputation from their body at the next meeting.

IV. That the Mayor do desire the Corporation of the Poor to depute a committee of their body to attend such a meeting.

V. That the Mayor do also request the Commissioners of the Improvement Rate will appoint a committee for the same purpose.

VI. That the Reverend Dr. Carwithen be informed that the company of the clergy, or a deputation from their body, would be desirable.

VII. That such meeting be held at the Guildhall, on Tuesday next, 1st November at 12 o'clock.

[20] Shapter, T. *The history of the cholera in Exeter in 1832*. London, Churchill, 1849.

By 14 November the Minutes contain a long list of names of places where local boards had been formed:[21] Newark, Canterbury, Folkestone, Wisbech, Cheltenham, Farnham, Peterborough, St. Asaph, Whitby, Bedford, Hertford, Peterhead, Shrewsbury, Devizes, Gravesend, Leith, Wells in Norfolk, Leyburn, Kirkaldy, Minchinhampton, Tynemouth, Harwich. To all of these Dr. Edward Seymour wrote, as he did to Exeter, courteously assuring doctors, mayors, magistrates, and clergy that the Board viewed with great satisfaction the prompt manner in which their recommendations had been carried into effect.

Arrangements were not always so amicable as appear to have been the case in Exeter according to the *Lancet:*[22]

> The promoters of the country Boards of Health have, indeed, one and all of them, taken their cue from the London Board—the despised and now sunk and degraded Board of London—and the same spirit which in this metropolis excluded from that Board not only every Licentiate of the College of Physicians, but every individual of the hundreds of surgeons residing in London who had personally witnessed the ravages of the cholera abroad—the same evil and illiberal spirit is now busily engaged in the formation of the provincial committees. . . . In accordance with the suggestions of Sir Henry Halford and his party, the magistrates of Liverpool—without any notification whatever to the inhabitants of the town or the great bulk of the resident professional men—met together, and secretly selected five physicians, their friends and proteges—men whom influence and interest had attached to the public charities of Liverpool . . . etc.

A stormy meeting was held in Liverpool at which "above 100 medical gentlemen were present" and attempts were made to upset the arrangements entered into by the magistrates.

THE END OF THE FIRST BOARD

The days of the Physicians' Board were numbered. On 9 November a letter was received from the Clerk of the Privy Council, which had within it the evidence of something like panic in the council office, Whitehall, apprising them of the fact that they had been summarily superseded.

> I am directed by the Lords of the Council to inform you that in consequence of the alarming appearance of the Cholera Morbus at Sunderland and the increased danger of contagion in which the country is menaced their Lordships are desirous of having at hand more constant advice and assistance than the professional avocations of the members constituting the Board of Health will permit them to afford. The Lords of the Council have therefore appointed Sir William Pym, the Hon^ble^ E. R. Stewart, Colonel Rowan, Lieut. Col. Michell, Dr. Russell and Dr. Barry to act as a Board,

[21] P.C. 1/105.
[22] *Lancet*, 1831, 2, 305.

sitting daily at this office and they trust that the Board of Health will have the goodness to communicate with these gentlemen concerning all matters to which they think it advisable that attention should be directed. I have it in command from their Lordships to take this opportunity of requesting you will express to the members of the Board of Health the high sense which the Lords of the Council entertain of the zeal and ability and unremitting attention, which has been displayed by that Board since the first period of its appointment. . . . GREVILLE.

Two days later (11 November) a further letter was received with even greater evidence of urgency asking that "all correspondence be passed over as expeditiously as possible," and containing further expressions of gratitude. The letter also asked that those members of the Board who were Fellows of the Royal College of Physicians would form themselves voluntarily into a committee to advise the Privy Council upon any medical matters which might be referred to them. Sir Henry twice expressed the greatest delight in the expressions of appreciation by their Lordships and promised on behalf of himself and his professional colleagues in the event of need "instant voluntary action." Perhaps this means that they did lose stipend, as suggested by the *Lancet*, as well as status. It must have been a cruel blow, softened a little no doubt by the knowledge that, since the cholera was now a reality and likely to spread rapidly, the duties of a Central Board of Health would take on a new tempo hardly in keeping, as their Lordships had pointed out, with their other many and important professional duties. Within a week the Secretary of the Privy Council wrote to them in their capacity of a *committee of physicians* referring to the difficulties being encountered in relation to the quarantining of the Sunderland coal boats—held up in the Thames according to their own advice six months before, for a period of fourteen days, with grave consequential trading losses. Did not the physicians feel in view of "recent observations of the medical Commission lately returned from Russia" that there might be some relaxation; might not the quarantine period be reduced to ten days? The Commission had in fact pointed out that "the germs of malignant cholera do not remain dormant in the constitution many days." Sir Henry Halford replied that the *committee of physicians* had given the matter immediate consideration; but that nothing in the evidence had seemed to them of sufficient importance to make them change their opinion. The administrative raspberry has been a delicious fruit in all ages.

The dissolution of the first Central Board of Health was greeted by the *Lancet*[23] with undisguised glee. "How are the mighty fallen!

[23] *Lancet*, 1831/32, *1*, 304.

The secret-bulletin-signer to His Majesty George IV—Physician General to the Court of St. James—'Professor' Manufacturer to the King's College—poor Sir *Henry Halford,* has at last dropped down to his legitimate level. This good old gentleman, this worthy member of the renowned Vaughan family, has been twirling it in Mr. Green's 'descensive circle,' and all at once has sunk, quite destitute *Sovereign* ballast, from the 'Council Chamber' of Monarch to the dirty 'Hall' in Pall Mall East."

PART II

THE CENTRAL BOARD OF HEALTH IN WHITEHALL

The new Central Board of Health, appointed on the authority of the Privy Council as announced in the *London Gazette* of 22 November, was established . . .

> "to prepare and digest rules and regulations for the most speedy and effectual mode of guarding against the speeding infection . . . and to communicate the same to all magistrates, medical persons and others of His Majesty's subjects, who may be desirous to be acquainted therewith."

The Constitution of the Board was as follows: The Hon. Edward R. Stewart, Chairman. Sir William Pym, K.C.H., Lieutenant-Colonel John Marshall, Dr. (later Sir) William Russell, Bart, Dr. (later Sir) David Barry, Major R. MacDonald, William Maclean, Secretary. Col. Rowan, head of the police force, seems not to have acted.

Stewart and Pym, full-time officials of customs and quarantine respectively, received no additional pay. Marshall and MacDonald, officers on half-pay from the army, received rather over £400 per annum; William Russell, late of the East India Service, received £730 per annum; David Barry, Deputy Inspector-General of Hospitals, also from the half pay, £511; and William Maclean, £250. Barry and Russell had recently returned from St. Petersburg. Thus, this Board differed from the previous Board at the College of Physicians, mainly in it being full-time and composed predominantly of persons who had first-hand information of the tasks in hand.

It was a working board by no means confined to the committee rooms of the Council offices in Whitehall; thus on 18 November Dr. Barry was commanded to proceed immediately to Sunderland to institute "a careful enquiry for the purpose of removing all doubt as to the nature of the disease existing in that town" and

having obtained such information, he was to return to town "to resume his seat at the Central Board of Health."

Some idea of the way in which its members threw themselves into the grim battle of combating the cholera can be appreciated from the Memorial (17 December 1832),[24] signed by its medical members (Macdonald, Marshall, and Barry) asking for an extension of pay for the quarter January-March 1833, after their official duties had ceased:

> . . . individual members of the Board have been obliged to make considerable sacrifices in devoting the whole of their time and energies to the establishing and carrying into effect a Code of Sanitary Regulations and to the direction and corresponding with nearly twelve hundred local Boards of Health independently of attending the numerous communications from the authorities in the different Parishes and Townships of Great Britain. . . .

Their travels had in fact taken them over large parts of the country at an inclusive expense figure of 9d. a mile.

Shortly after its formation (22 February 1832) the new Board was employing, in addition to its own medical members, 21 medical officers: 3 deputy inspectors general of hospitals; 4 staff and regimental surgeons; 2 assistant staff surgeons; 3 surgeons R.N.; 1 assistant surgeon in charge of a district; 3 assistant surgeons; 1 deputy inspector-general of hospitals (Glasgow); 2 assistant surgeons (Glasgow); 1 assistant surgeon (Newcastle); one assistant surgeon (Hetton). These no doubt included the medical superintendents appointed in early February to the Metropolitan Districts.

The early days of the new board were spent in straightening out administrative procedures and in the more difficult task of welding a haphazard system of local boards, which had so far been left largely to their own devices, into a national weapon of defence against the cholera. A Proclamation (21 November) dealt with the statutory position of local boards; it said:

> Boards of Health shall forthwith be established in every city, town, or place within the United Kingdom *to which an order for that purpose shall be transmitted by the Lords and others of his Majesty's Privy Council, such order being certified by the signature of one of the clerks in ordinary of the Privy Council.*

The words in italics were intended to introduce a measure of formality which had hitherto been lacking; but it is difficult to understand why the procedure of formally constituting local boards by Order in Council could not have been included in the original Order in Council of 20 October. Certainly the Proclamation caused

[24] P.C. 1/96.

concern among the local boards now busily setting about the affairs of their localities. A printed circular was hastily issued with the object of setting at rest the doubts of such locally established organs as to the legality of their work.

> I am directed to acquaint you that the Lords of His Majesty's Most Honourable Privy Council do not think it necessary that the Board of Health should be appointed with the powers mentioned in the Orders of 21st November, 1831, except in the event of the Cholera breaking out in your town, or in the immediate neighbourhood; or in the event of some other case of great urgency occurring, the circumstances of which will be taken into consideration upon the same being specially represented to their Lordships.
>
> The Order of the 21st November was not intended to cancel the Boards of Health then in existence, nor to prevent the formation of any others that might have been contemplated in consequence of the Order of the 20th October; and their Lordships are of opinion that such Boards of Health may be very beneficially employed in discharging the duties marked out in the circular of the Central Board of Health of 14th November, 1831.

When Stockton-on-Tees asked for a formally constituted board on 30 November, this request was granted since their Lordships deemed the case an exception to the rule laid down in the Circular of the 25th "because of its contiguity to Sunderland." But once the cholera had begun to spread, the Privy Council took a different line. It was clearly intended that no local board should derive any authority to raise money, or to take steps under the authority of the Privy Council, unless they were properly constituted under Order in Council. This required the formal submission of the names of the proposed board, arrived at in public meeting; and the equally formal acceptance of these by their Lordships, ratified under seal. The thirteen months of the Board's existence were appreciably taken up with the procedure of making such orders; any request for information or advice, or for special powers from any local board which had not been formally constituted was followed by a statement to this effect from the Secretary of the Board. To enable the Board at Croydon "to act under the Orders in Council of the 29th ult. and 6th instant," said the Secretary on 6 March, "it must be confirmed by the Privy Council . . ." Many enquirers were told that the proposals for a board must be arrived at in open meeting; but at least in the case of Blackburn it was said "if not at an open meeting at all events with the concurrence of the magistrates and local authorities of the town." In the case of Worcester (12 April), after receiving information that twelve respectable medical practitioners of the town had publicly protested against the manner in

which the Board had been constituted, the Secretary wrote aptly suggesting that the constitution might be adjusted to include medical men of longer standing.

Much more controversial was the question of duties and powers for the local bodies. The second Order of 21 November entitled "Removal of Nuisances" declared it lawful for two Justices of the Peace, in places where boards of health shall have been established in virtue of Orders in Council, on the certificate of a medical practitioner being a member of such a board, and on the oath of one credible witness, to issue orders to overseers and guardians of the poor for the purpose of having such public nuisances as were certified to be injurious to health abated or removed. Unfortunately, as letters from all over the country quickly pointed out, the Order was void because it was not supported by the Statute on which it was founded.[25] Moreover, it had little preventive value as was pointed out by a solicitor in Haddington:

> These regulations are only to have effect in those places where a Board has been constituted by the Privy Council, and where, consequently, cholera most probably prevails; while it appears to me that these measures should have been directed towards preventing the extension of Cholera to those places which it had not reached, as much as towards checking it in places already infected.[26]

Two orders (14 November and 13 December) gave advice on matters of local detail. That of 14 November again suggested the need for district committees but deprecated both coercive action in separation of the infected and also the fitting up of expensive hospitals. This was apparently in response to the prevailing concern about too vigorous local action. Nevertheless, the Order of 13 December entitled "Sanitary Instruction for Communities supposed to be attacked by spasmodic cholera" dealt with measures for isolation, ventilation, cleanliness, fumigation, purification of linen, speedy burial of the dead, food, and clothing. It recommended a general issue of flannel belts and stockings which had been said to have a great preventive quality. Exeter began collecting money for this purpose; 'flannel for the poor' became the city slogan.

The Cholera Act

The cholera had continued its slow but relentless progression. At first England was largely spared as the disease attacked the Scottish coal and iron districts. But cases occurred in London, where it

25 6th George IV c 78.

26 R. Riddell to W. Maclean, Haddington, 21 January 1832, House of Commons Papers 14 February 1832.

had probably arrived by sea, on 13 February and subsequently from April onwards there were outbreaks in a great number of places. The disease reached Exeter on 12 July.

The slowness of the epidemic spread and its relentless quality were both important elements in maintaining a pressure of public opinion and stimulating both central and local action. By the middle of 1832 nearly 5,000 persons had died.

In some doubt as to the legality of the procedures so far taken by the Privy Council, and in order to make provision for finance, Parliament hurried a Bill through both Houses which became the Cholera Act—"An Act for the prevention, as far as may be possible, of the disease, called the Cholera, or spasmodic, or Indian Cholera, in England." This enabled the Lords of the Privy Council to make orders for the prevention of cholera and provided that any expenses which might be incurred in carrying out such orders should be "defrayed out of the relief of the poor of the parish, township, or extra parochial place, maintaining its own poor." The Act was followed by the Order (29 February 1832) which again told the local Boards to get on with the job and the Order of 6 March which provided,

> that all Boards of Health shall, with the consent of vestries, erect or provide temporary hospitals and also 'houses of observation' for the reception of persons not at the time affected with the said disease, but whom it may be necessary or proper to remove from communication with infected persons; . . . also to procure and purchase a sufficient and necessary supply of beds, food, clothing, fuel, and medicine, and to engage medical assistance, and nurses and other necessary attendants.

An Order in Council (19 July) again dealt with sanitary measures: Boards were directed to apply to the vestries for money for medical and nursing care, cleansing and white-washing houses, removing dangerous impurities, and for effecting the removal of filth or offal from slaughterhouses in populous districts, for engaging medical officers to report on the sanitary conditions of lodging houses for vagrants, for opening and scouring such drains and water courses, and for covering open drains or cesspools as such parishes might desire to cleanse or cover, defraying the expenses thereof out of the parish funds, for purchasing, enclosing, and fencing lands for burial grounds and cemeteries, and for paying the funeral expenses of those dying of cholera.

Sanitary regulations were again issued in August 1832,

The Central Board of Health have deemed it advisable to re-issue the sanitary circulars relating to spasmodic cholera, dated respectively 14th November, 13th December, 1831 and 9th May, 1832, with the following alterations and additions, which in their opinion have been rendered necessary by the presence and gradual spread of the disease in this country since October last. Council House, Whitehall, August 9th, 1832.

Local Sanitary Government

The local boards were being slowly built up into something like a modern public health authority. But as might have been guessed, once they began to think in terms of active public health measures, they found themselves in considerable difficulties. Where was the money to come from? What powers had they to remedy nuisances? What was their relationship to existing bodies? These problems were to occupy most of the remainder of the period until the cholera epidemic had burnt itself out.

Powers to remedy nuisances

The Cholera Act left all the real problems unanswered, for it failed to provide for any summary jurisdiction to deal with nuisances. Parliament had rushed through an Act with insufficient thought for the powers that local boards would require if they were to do anything effectively to remedy the bad environmental and social conditions which existed. Indeed from the outset of this episode we can see the real failure was that of statutory legislation. The Minute Books, full of urgent letters, show that local opinion was alive to the dangers of squalor and insanitary living, and it was ready to take vigorous action. But Parliament never gave the necessary direction; subsidiary legislation by Orders in Council could not then, as it cannot now, initiate social laws but can only direct in detail that which Parliament has prescribed. Whatever the Lords of the Privy Council might themselves feel, and no doubt they were powerfully affected by the flood of exasperated comment coming in from all over the country, they could not authorise anything that Parliament had not accepted.

The secretary of the Central Board of Health wrote almost daily a standard reply to requests for power to remedy nuisances, that *"the Lords of the Council have now under consideration what powers it may be necessary to confer for the removal of nuisances generally in consequence of the passing of the Cholera Prevention Act."* The Secretary of the Privy Council likewise wrote frequently on the same topic until 31 December 1832 when the Board ceased

to exist. Nearly every local board sooner or later found itself in the same dilemna; cholera was due to insanitary conditions, they had been enjoined to prevent the cholera; how were they to get rid of the predisposing causes when they had no powers to act? Their Lordships, in fact, never concluded their considerations; it was too difficult a matter to solve.

So great were these difficulties that by 4 August 1832 the Exeter Board found itself paralysed. It could not provide a separate burial ground, it was unable to remove nuisances in private houses or premises. A suggestion was actually made in Exeter that the Corporation for the Poor (an incorporation of vestries) should take over the powers of the local Board of Health under an Order of the Privy Council.

The fact that this early public health machine was virtually without any power to act on its own behalf resulted chiefly from a Parliamentary failure to see the implications of the epidemiological observations which Barry and Russell and so many other doctors had made. Cholera thrived among poverty and in slums. The real preventive was to attack these social evils, and to do this required a Sanitary Code and the full backing of Parliament. For this, even in embryo form, we had to wait until the Chadwick Act in 1848.

Meanwhile Exeter, and probably many other places, eventually overcame these difficulties by working closely with the Commissioners for Improvement. Committees of the Board of Health reported the state of every street and house, and the Commissioners in turn set about street cleaning and issued handbills. They voted £3,000 for sewers, water, and cleaning. They abolished piggeries, etc., so that when Shapter wrote in 1849, he was able to say: "In the city the effects produced have been striking; it has emerged from a selfish apathy to an active consideration of the well-being of the community."

Local boards were also encouraged to work with the police, not only for the ordinary nuisances but in more venturesome public health measures. "By whom or by what authority," wrote Mr. W. G. Iliff from Newington (5 March), "can unwholesome meat or fish be destroyed if offered for sale"? The Central Board of Health replied that the subject appeared to be on matters of local police, but that the general question connected with the removal of nuisances is under consideration of the Lords of the Council.

For many other public health problems there appeared to be no answer. The Board of Health at Cheltenham (10 April) asked

how they could regulate lodging houses, but were told that this presented so many difficulties that their Lordships did not intend to deal with the matter.

Finance

The question of money was equally troublesome. At the outset, Lord Melbourne received a letter (9 November 1831) from James Snales, President of the Board of Health at Leith, in which he said:

> In a town like this, it appears to be in vain to expect that any voluntary subscription can be raised to such an extent as would enable the proper precautions of providing for the greater cleanliness and comfort of the lower classes to be effectually adopted. We have no municipal funds; and the police funds, if they could legally be applied to such purposes, are at present exhausted.

In consequence of this and other letters, the Lords of the Privy Council wrote to the Treasury stating that:

> The probability of very strong claims being urged by Parochial Authority and Local Boards of Health for pecuniary assistance and requesting to be informed whether any money can be placed at the disposal of the Board established at the Council Office in Aid or Parochial Funds and of Local Subscriptions, and if so upon what principles and with what limitation it may be distributed.

Mr. Springfield Rice, one of the secretaries to the Lords of the Treasury, replied cagily that

> he had it in Command from their Lordships to acquaint the Clerk of the Council in Waiting for the information of the Lords of the Privy Council that their Lordships would feel it a duty to assist local efforts to advert or repress the progress of disease when such pecuniary assistance was really required and where there was security that it would be discreetly and safely applied, the Principles upon which any such pecuniary assistance could be required appeared to their Lordships to be as follows.

The principles upon which such aid was to be granted were first that there should be a local committee or authorised body through which it could be done, that payments would be supplementary to local parish or voluntary funds, that a specific recommendation for payment should be supplied by the Central Board of Health. Without these and "if it were so granted as to repress rather than stimulate local exertions," all aid from the Public Purse would be prejudicial rather than useful. This was sound reasoning in so far as it recognised the need for local government in public health but insufficiently appreciative of the cost of making an effective attack upon insanitary living.

The Cholera Act subsequently required the vestries to defray the costs; but, as can be imagined, this was an invidious position for the boards of health to find themselves in. Letters from mayors, sheriffs, doctors, and other persons acting as secretaries of the local boards poured into the Central Board asking what would happen if the vestries refused to pay, resulting again in a standard reply such as the following:

> That a letter be written to Mr. Galton, Chairman of the Board of Health at Birmingham . . . the amount of expenses to be defrayed out of the Parish Funds . . . should be submitted to the inhabitants of the parish in their several vestries in order to receive their sanction; and that in the event of such sanction being unreasonably withheld or the vote of the sum of money . . . refused on insufficient grounds; no doubt need be entertained that their Lordships would extend their protection. . . .

And generally such protection was given. When Christchurch (Surrey) vestry refused to pay, an Order was published in the *Gazette* "making it imperative upon the Parochial Authorities to reimburse from the poor rates £200/17/." When later (25 April) Christchurch vestry, which seemed to be particularly refractory, refused to sanction the levying of a rate for a cholera hospital, a special order was published in the *London Gazette* authorising the Board of Health to raise the sum of £100; it was not made clear how this should be done.

The parish of Birmingham (27 April) refused the local Board of Health the sum of £460 with the result that an Order was published in the *Gazette* authorising the Board of Health at Birmingham to raise the sum. The propriety of this action was explained at some length to the Birmingham vestry, for the Privy Council clearly had no wish to offend.

> That it be recommended to the Lords of the Council that a letter be written to Mr. Whately signifying their Lordships approbation of the building engaged and the preparations made by the Overseers and Guardians of the Poor of Birmingham for the care of the Parish Paupers attacked with cholera, but observing that the Board of Health constituted by their Lordships was appointed to superintend measures for the prevention or cure of cholera, over the whole population generally, or a district of considerable extent, and that it is impossible for their Lordships not to afford support to the Boards of Health so appointed, and encourage to proceedings in their labours under the assurance of receiving protection in the just exercise of their functions, their Lordships have therefore been pleased to issue a special Order; authorising the Board of Health at Birmingham to raise a sum of £460 agreeably to the estimate submitted to the vestry.

Toward the end their Lordships began to suggest that any difficulties were best met by doing nothing. The Corporation for

the Poor at Norwich refused to pay for a hospital. Would it not be better, said the Secretary of the Council in a letter to the Board of Health, to let the matter rest, "as cholera was not now prevailing." When much the same happened in Boston, they gave the opinion that "It would be expedient to accept the hospital offered by the vestry although the site may not be perfectly convenient, provided such hospital be placed under the controul [*sic*] of the Board of Health."

So maddeningly difficult did the question of money become that authorities sought their own funds by public subscription. The Exeter Board, after trying without success to get rid of all responsibility to the Corporation of the Poor, held another of its numerous public meetings (10 August) at which it was resolved "That in order to carry into effect the foregoing measures a fund be forthwith raised by Bona Fida subscription." They got £4,082.14.4. The Lord Provost of Edinburgh was authorised by Order to raise £4,000, it being distinctly understood that this sum did not include any expenses in connection with the distribution of food and clothing which must be dependent upon charitable contributions. It was a hand-to-mouth business. The machine had been established; but no one had worked out how or what it should do.

Overlap of Functions

Many difficulties also resulted from overlap, conflicts, and jealousies of various local authorities: Commissioners of Sewers, private and public water companies, Improvement Commissioners, vestries and Corporations for the Poor, the police. Local patriotism under the leadership of the Mayor and magistrates, spurred on no doubt by the fear of pestilence, did much to overcome these internal jealousies. Where there were private acts for improvement in force, the Commissioners of Improvement responded to urgent calls made upon them; in Exeter they consented to forego the income obtained from the sale of night soil by contracting for its removal; thus, by doing the job themselves they avoided a method which inevitably led to dangerous accumulations. The Commissioners of Sewers, who no doubt were also little pleased to find a new body who could direct them how to set about their business, nevertheless began to follow the directions of the local boards of health; in Exeter, as in many other places, there seems to have been an amicable arrangement. Thus on 22 September it was reported,

That sewers in Guinea-Street and Idle-Lane were completed, and as the medical gentlemen of the Board of Health had signified that certain sewers might be immediately commenced without endangering the salubrity of the city, it was ordered that sewers should be made in the following streets . . . .

In Southwark it was different; on 30 April the Central Board of Health wrote to the Commissioners of Sewers of this London parish admonishing them for refusing to carry out works which the local Board of Health had considered to be necessary.

The greatest conflict of interests arose with the vestries; the overseers found difficulty in collaborating with the new boards. They were represented on most if not all local boards and they attended public meetings; but their position in having to pay the piper without calling the tune was unenviable. There was also a muddle over respective responsibilities, so that, e.g., pauper patients with the cholera could be cared for in pauper hospitals, while other patients, although paid for out of the poor rate, were admitted to hospitals under the board of health. In some instances, where the parishes of a town had become incorporated as at Norwich, Bristol, and Exeter, there seemed to be no power, under a strict interpretation of the Cholera Act, for any financial call to be made upon the Corporation of the Poor. This led to lengthy correspondence with the Privy Council without any satisfactory solution. The battle between Poor Law and public health had thus already begun; it was to be a hundred years' war.

The End of the Central Board of Health

The Central Board of Health was dissolved on 31 December 1832. One of its last records (18 December) is a compilation of authenticated reports from isolated communities in which possible sources of infection had been carefully examined. This report concluded with the words:

From the above facts observed in distant limited communities authenticated by collective bodies, and carefully verified by our Secretary, it appears to be proved that whether there be other causes capable of originating cholera or not the arrival of one or more individuals sick of that disease in the midst of a Community, hereto exempt from it, is at least one of the modes by which the disease is propagated.[27]

After this the Privy Council office continued to conduct the business of a Central Health Administration, dealing with the details of the constitution of the Boards and the day-to-day en-

[27] P.C. 1/2662.

quiries, for a further 18 months. During 1833 they began to make it known that the Lords of the Privy Council did not mean to call for a renewal of the powers derived under the Cholera Prevention Act, which they said was due to expire at the close of the present session of Parliament. After this it was suggested:

> That as the disease will probably be contemplated henceforth in the same sanitary light as any other dangerous malady which may have become domiciled in the country, its management therefore must be left to the prudence and good feeling of those communities where it may occasionally show itself.[28]

or

> As the Cholera Act will expire with the present session of Parliament, it would be desirable that the different Parishes should make arrangements for taking care of Cholera Patients, if any case should occur in the same way as is done during the prevalence of Typhus or any other infectious disease.[29]

The last entry in the Minute Book, dated 10 May 1834, is addressed to Bethnal Green. In this the Secretary gives their Lordships' opinion that the remaining funds of the Board of Health should be retained against "the event of any disease again making its appearance in the district." The episode is over. Public health was not yet seen as a permanent need. 'Boards of Surveillance' had been tried out and their particular needs and circumstances were perhaps more clearly seen. It seems to have been a lost chance that an organisation so painfully constructed and full of possibilities for progress should have been so lightly discarded; but it helps us to understand how difficult was the birth of the British ideal of *local sanitary government*. Does it perhaps also suggest that Edwin Chadwick may have been building more on what had gone before than some of his biographers and historians have given us to believe?

28 Letter to Dr. Walker, Huddersfield, 15 August 1833. P.C. 1/96.
29 Letter to Alex Douglas, Board of Health, Douglas, Isle of Man, 2 May 1834. P.C. 1/97.

Notes and Events

Edited by Dorothy M. Schullian*

Sir Richard Blackmore in the Judgment of his Fellow-Writers

I am grateful to Samuel Johnson[1] (through Dr. L. C. McHenry[2]) for telling me Sir Richard Blackmore was a physician; at his death he was censor of the Royal College.[3] This is mentioned in neither Pope's satires nor Boswell's *Life of Johnson*.[4] In his *Life of Dryden*,[5] Johnson said that Blackmore got his evil reputation through being worsted in a quarrel with Dryden just before he died. In his brave *Satire upon Wit* (1700) Blackmore had castigated the obscenities and slanders perpetrated by even the best writers. He lamented the exuberance of false and the deficiency of true wit. He proposed that it all should be melted down and recoined:

> Tis true that when the coarse and worthless dross
> Is purged away, there will be mighty loss;
> Ev'n Congreve, Southern, manly Wycherley
> When thus refined, will grievous sufferers be;
> Into the melting-pot when Dryden comes
> What horrid stench will rise, what noisome fumes?
> How will he shrink, when all his lewd allay
> And wicked mixtures, shall be purged away!
> But what remains will be so pure, twill bear
> Th' examination of the most severe.[5]

Blackmore disliked Dryden's savage replies and omitted the final two lines in the last edition of the *Satire upon Wit*.[6] Thus he is unjustly reputed a malevolent critic of Dryden[7] like the Reverend Luke Milbourne. In the preface to his *Fables Ancient and Modern*, Dryden attacked Milbourne, then said:

As for the City Bard or Knight Physician, I hear his Quarrel to me is, that I was the Author of *Absalom & Achitophel*, which he thinks is a little hard on his Fanatique Patrons in *London*. But I will deal the more civilly with his two Poems, because nothing ill is to be spoken of the dead. . . .[8]

Dryden had written too, in a prologue on the occasion of a representation for his own benefit, one of his most vicious lampoons:

* Cleveland, Ohio.

1 Johnson, Samuel. *Lives of the English poets*. London, Oxford University Press, 1952, 2, 35-52.

2 McHenry, L. C. Dr. Samuel Johnson's medical biographies. *J. Hist. Med.*, 1959, *14*, 298-310.

3 Johnson,[1] *2*, 45.

4 Boswell, James. *The life of Samuel Johnson*. London, Oxford University Press, 1934, 2 vols.

5 Johnson,[1] *1*, 281-282.

6 Johnson,[1] *1*, 282; *2*, 39.

7 *The poems of John Dryden*, edited by John Sargeaunt. London, Oxford University Press, 1948. 606 pp.

8 Dryden,[7] 278.

Quack *Maurus*, tho' he never took Degrees
In either of our Universities,
Yet to be shown by some kind Wit he looks,
Because he plai'd the Fool, and writ Three Books.
But if he wou'd be worth a Poet's Pen,
He must be more a Fool, and write again:
For all the former Fustian stuff he wrote
Was Dead-born Doggrel, or is quite forgot;

* * *

At leisure Hours in Epique Song he deals,
Writes to the rumbling of his Coaches Wheels;
Prescribes in hast, and seldom kills by rule,
But rides Triumphant between Stool and Stool.

* * *

A Pedant, canting Preacher, and a Quack,
Are load enough to break one Asses Back:
At last, grown wanton, he presum'd to write,
Traduc'd Two Kings, their kindness to requite;
One made the Doctor and one dubb'd the Knight.[9]

Blackmore had been made Fellow of the College of Physicians in 1687 by a special Act of King James II;[10] in 1697 he was knight and physician-in-ordinary to King William.[11] He continued teaching high morality in poor verse and worse prose to the end of his days. But the wits were his enemies—especially Pope[12] who admired Dryden. Later, Pope in his epistle to Augustus (1735) did not exclude Dryden from his own condemnation of obscenity and servility:

I scarce can think him such a worthless thing,
Unless he praise some monster of a king;
Or virtue or religion turn to sport,
To please a lewd or unbelieving court.
Unhappy Dryden! In all Charles's days
Roscommon only boasts unspotted bays.[13]

Johnson attributed Pope's hostility to an attack by Blackmore over Pope's burlesquing of a psalm.[14] In the *Essay on Criticism* (1709), however, Pope had early attacked Blackmore for his criticism of Dryden:

Pride, malice, folly, against Dryden rose,
In various shapes of parsons, critics, beaux;
But sense survived, when merry jests were past;
For rising merit will buoy up at last.
Might he return, and bless once more our eyes,
New Blackmores and new Milbournes must arise.[15]

9 Dryden,[7] 261-262.
10 Johnson,[1] 2, 36.
11 Johnson,[1] 2, 37.
12 *The poetical works of Alexander Pope*, edited by W. A. Rossetti. London, Ward Lock, 1898. 600 pp.
13 Pope,[12] 216, lines 209-214.
14 Johnson,[1] 2, 44.
15 Pope, [12] 22, lines 458-463.

Pope's next attack three years after Blackmore's death *(Dunciad,* 1728) shows Blackmore winning a braying competition:

> But far o'er all, sonorous Blackmore's strain;
> Walls, steeples, skies bray back to him again.
> In Tottenham fields, the brethren, with amaze,
> Prick all their ears up, and forget to graze.
> 'Long Chancery Lane retentive rolls the sound,
> And courts to courts return it round and round;
> Thames wafts it thence to Rufus' roaring hall,
> And Hungerford re-echoes bawl for bawl.
> All hail him victor in both gifts of song,
> Who sings so loudly, and who sings so long.[16]

Pope next mentioned Blackmore in his first satire (1730). He portrays the Hon. W. Fortescue advising Pope to give up writing:

> F. Or, if you needs must write, write Caesar's praise,
> You'll gain at least a knighthood, or the bays.
> P. What, like Sir Richard, rumbling, rough and fierce,
> With Arms, and George, and Brunswick crowd the verse,
> Rend with tremendous sound your ears asunder,
> With gun, drum, trumpet, blunderbuss, and thunder.[17]

In his third satire (to Lord Bolingbroke) Pope still harps on his need to stop writing:

> A voice there is, that whispers at my ear,
> (Tis reason's voice, which sometimes one can hear)
> "Friend Pope! let your muse take breath,
> And never gallop Pegasus to death;
> Lest stiff and stately, void of fire and force,
> You limp, like Blackmore on a lord mayor's horse."[18]

Boswell[19] relates that in 1769 he defended some supposed lines of Blackmore's which Johnson and others had ridiculed as nonsense:

> A painted vest Prince Voltiger had on
> Which from a naked Pict his grandsire won.[19]

At that date not even Johnson knew that the words were not Blackmore's. In a footnote Boswell wrote that he had consulted Blackmore's poems in 1792 and found the lines did not exist; Blackmore had been victimized.[19]

Johnson died before this crime was discovered. He had said in 1769 that the critics had done too much honour to Blackmore by writing too much against him,[17] but he changed his mind before 1779. In his *Life of Watts*[20] he said that on his own authority he had added Blackmore and

16 Pope,[12] 302-303, lines 259-268.
17 Pope,[12] 184, lines 21-26.
18 Pope,[12] 196, lines 11-16.
19 Boswell,[4] *1*, 405.
20 Johnson,[1] 2, 360.

three other writers to the 48 names selected by the booksellers for his *Lives of the English Poets*. In these volumes, said Boswell,[21] "Johnson [aged 70] gave the world a luminous proof that the vigour of his mind in all its faculties, whether memory, judgement or imagination was not in the least abated." In 1781 the final volumes appeared.[22] The space Johnson had given Blackmore exceeded that accorded 41 of the 52.[1] He admired Blackmore's character more than his ability; he had never replied to any further attacks on him. Here is Boswell's comment:

In the Life of Blackmore, we find that writer's reputation generously cleared by Johnson from the cloud of prejudice which the malignity of contemporary wits had raised around it. . . . We trace Johnson's own character in his observations on Blackmore's "magnanimity as an author." The incessant attacks of his enemies, whether serious or merry, are never discovered to have disturbed his quiet, or lessened his confidence in himself.[22]

MICHAEL KELLY

Eggs (and Eggheads)

By courtesy of Dr. Curt F. Bühler, Keeper of Printed Books at The Pierpont Morgan Library, and permission of Dr. R. W. Ladborough, Pepysian Librarian at Magdalene College, Cambridge, the Journal is privileged to publish a Middle English device, discovered by Dr. Bühler in Pepys MS. 878, page 181, for ascertaining whether a patient would live or die Italicized letters in the following transcription represent abbreviations or Anglo-Saxon letters difficult of reproduction here:

ffor to wete yif a man schal dye or leue.

For to wete yif a man schal dye or leue. Take an egge *th*at his leyde *th*e same day of an henne & wryte *ther*-on *th*ese lettres. 3. f. g. f. y. 9. x. g. y. s. *th*anne ley *th*in egge hundir hym in a saffe place al a ny*gh*te & yif *ther* be blod wi*th*-inne he schal dye & yif *ther* be non he schal leue.

This is followed by a sentence in Latin which would seem to be connected with these instructions but in which no assistant is involved; the man himself, whether a patient or not, is to write the magic characters on a piece of parchment and lay this under his head when he goes to bed:

Si uis ut appariet u*idelicet* in sompno rem tuam furat (?) scribe as litteras i*n* pargamino & pone sub capite q*uando* vadis ad lectu*m* tuum.

The Journal will be grateful for any clarification of these instructions, which present more than one problem, and for parallels to them in any civilization or period. The important role of the egg in superstition everywhere is a commonplace. One is reminded, e.g., that in Maria Dermoût's

21 Boswell,[4] 2, 280.
22 Boswell, 2, 372-373.

Yesterday, translated from the Dutch by Hans Koningsberger (New York, Simon and Schuster, 1959), page 15, it is accepted that the second water carrier will soon die because several times he has found under the threshold of his house an egg with a needle and hair and nails. And quite apart from predictions of death, a Reuters dispatch of 1960 called attention to the belief existing in some parts of Ghana that a pregnant woman who eats eggs will be delivered of a child with an egg-shaped head.

"The Indefatigable Beaumontian"

It was in the issue of October, 1959 (*14*, 531) that the Journal's physiologist Editor, of affectionate memory, acclaimed the historical activities of Alfred H. Whittaker by terming him "the indefatigable Beaumontian." The adjective still applies, and it applied then in a very special sense which became apparent only later.

On 12 October 1959 Dr. Whittaker had an engagement to speak on William Beaumont before the senior class of the Wayne State University School of Medicine. He had just finished arranging his slides when he experienced severe pain in the back and shock. In eight hours of subsequent surgery at the Detroit Memorial Hospital a dissecting aneurysm was removed and a large abdominal artery was replaced with a prosthesis of Dacron.

In long days of convalescence Dr. Whittaker remained the historian and in his thoughts applied history to his own case. Through the years he had brought together a splendid collection on the history of industrial medicine; now it was industrial chemistry which had aided him. Flexible porous tubes composed of synthetic fibers developed in industry were recommended for vascular surgery in 1955 by W. S. Edwards and J. S. Tapp in their article "Chemically Treated Nylon Tubes as Arterial Grafts" (*Surgery, 38*, 61-70). Before the adoption of these in clinical practice dependence had been placed on arterial homografts which were not consistently successful. The nature of the synthetic tubes recalled to Dr. Whittaker Sir Humphry Davy's safety lamp, which protected the lives of thousands of miners by interposing fine wire gauze between the open flame and explosive gas (*Philosophical Transactions of the Royal Society of London*, 1816, 1-24).

It is a pleasant coincidence that the operation was the product of research in vascular surgery in the dog laboratories of Wayne State University, from which Dr. Whittaker holds an honorary degree, and that Dacron was developed in polymer research at the Dupont Laboratories by Dr. Preston Hoff of Ohio State University, where Dr. Whittaker was graduated in medicine.

Research Grants in the History of Medicine, National Institutes of Health

Fourteen research grants have recently been awarded in the History of Medicine Program of the National Institutes of Health. The recipients, with the subjects of their research, are as follows: Paul Cranefield, "Historical Study of the Problem of Mental Deficiency"; Claude Dolman, "Essays in the History of Bacteriology"; E. M. K. Geiling, "Pharmacology and Dr. John J. Abel"; Isidor Greenwald, "History of Goiter in Various Countries"; Gerald Grob, "History of the Worcester State Hospital since 1833"; Martin Levey, "The Chemical Background of Early Arabic Medicine"; Levi Lind, "Studies of the Sixteenth Century Bolognese Anatomists"; Loren C. MacKinney, "Pre-Modern Practices in Manuscript Miniatures and Texts"; Curt Proskauer, "History of Oral Hygiene"; Lelland Rather, "Philosophy and History of Medical Ideas"; Walther Riese, "The Origins of Modern Psychiatry"; Patrick Romanell, "John Locke's Manuscripts in Medical Philosophy"; Wolfgang Schwarz, "Hermann Rorschach, M.D.: A Study of his Life and Work"; James Young, "A History of 20th Century American Quackery."

Death of Samuel L. Sobol

Bern Dibner, Director of the Burndy Library, has informed the Journal of the death on 1 December 1960, in Moscow, of Professor Samuel L. Sobol. Dr. Sobol was a member of the Institute of the History of Science and Technology of the USSR, editor and translator of *The Autobiography of Charles Darwin*, and founder of a collection of over a thousand microscopes dating from 1700 to modern times. This collection, together with a large library on the history of the microscope, forms part of the Academy of Sciences of the USSR.

D. J. Davis Lecture

Dr. Otto F. Kampmeier, Professor Emeritus of Anatomy, will deliver the annual D. J. Davis Memorial Lecture on Medical History at 1 p.m. on Wednesday, 17 May, in the Medical-Dental-Pharmacy Building of the University of Illinois College of Medicine, Chicago, Illinois. His subject will be "The Turbulent Rise of Medical Education in Illinois." The occasion immediately precedes the Thirty-Fourth Annual Meeting of the American Association for the History of Medicine, Inc. in Chicago 18-20 May.

The Ida and Henry Schuman Prize in the History of Science

An annual award of $250 has been established by Henry and Ida Schuman of New York City for an original prize essay in the history of science and its cultural influences. This competition is open to graduate and undergraduate students in any American or Canadian college, university, or insti-

tute of technology. Papers should be approximately 5,000 words in length, exclusive of footnotes, and thoroughly documented.

Papers should be sent to the Chairman of the Prize Committee, Professor Edward Grant, Department of History and Logic of Science, Indiana University, Bloomington, and must be received on or before 1 July 1961.

Essays dealing with medical subjects are not acceptable, although papers dealing with the relations between medicine and the natural sciences will be welcomed. Announcement of the prize-winning essay will be made at the annual meeting of the History of Science Society. It is hoped that it will be suitable for publication in *Isis*.

Thirty-fourth Annual Meeting of the
American Association for the History of Medicine

Date: 18-20 May 1961
Place: Chicago, Illinois
Headquarters: Shoreland Hotel
Local Chairman: Dr. Ilza Veith

Book Reviews

GEORGE ROSEN. *A History of Public Health.* New York, MD Publications Inc. [1958]. 551 pp. $5.75.

Reviewed by GENEVIEVE MILLER, *Assistant Professor of Medical History, Western Reserve University School of Medicine; Research Associate, Cleveland Medical Library.*

WHILE there are a number of studies on a local or national level, a general history of public health has never before been written. Therefore we are enriched by Dr. Rosen's skillful synthesis, which brings us for the first time a comprehensive monograph on the subject.

Defining public health as "community action in the promotion of health and the prevention and treatment of disease," the author extends his narrative from ancient India, Egypt, and Mesopotamia to modern America. In nearly five hundred pages of text may be found a clear, accurate exposition of the public health problems and methods of solution in each historical era, with just emphasis, over two-thirds of the book, placed on the period from 1750 to the present. Factual information about the ancient Roman water supply, epidemic diseases, or modern U. S. federal housing has its place along with the 19th century European sanitary movement and bacteriological discoveries. Dr. Rosen's book rests solidly upon his thorough general knowledge of the history of medicine and his special studies on English, French, German, and American public health from the 17th century to the present which have incorporated his sociological training. He is thus able to integrate events of his narrative with the concurrent social and economic milieu, the philosophy of which, more than health hazards themselves, frequently determined the nature and extent of public health activities. Thus his book may be read on a number of levels: as a storehouse of accurate factual material, or as an interpretative study which furnishes an insight into causes, and on this level it is especially valuable for present-day public health personnel.

The two concluding chapters devoted to "The Bacteriological Era and Its Aftermath (1875-1950)" are excellent not only for their succinct review of the public health victories won from knowledge of bacteriology and immunology, but also for the author's perspicacious view of new problems which have resulted from economic and social trends in a changing society. The increasing attention to maternal and child welfare, the development of public health nursing, voluntary health organizations, public health education, occupational health, sickness insurance, medical care programs, and governmental role in health promotion are carefully outlined, with major emphasis on events in the United States.

The book is enriched by a detailed bibliography to each chapter and by the following appendices: "Memorable Figures in the History of Public Health" (oddly enough not included in the index), a "Selected List of Periodicals concerned Chiefly or Entirely with Public Health," "Public Health Societies and Associations in the United States and Other Countries," "Schools of Public Health." This work should be required reading for all public health workers and trainees in this country, just as it should be available in every medical library as a convenient reference book for accurate historical data in this field.

MARVIN K. OPLER, Ed. *Culture and Mental Health.* New York, The Macmillan Company, 1959. vii, 533 pp. $8.75.

Reviewed by ILZA VEITH, *Associate Professor in the History of Medicine, University of Chicago, Chicago 37, Illinois.*

THIS is an extraordinary volume which brings together the essays of 23 authors dealing with culture and the effect of cultural stress on mental health in five continents and on the islands of Formosa and the South Pacific. Although each contributor has treated his subject in a different and entirely personal fashion, the total does present a unified whole since all of them utilize the social psychiatric approach. The boundaries of this field are cogently explained by Marvin K. Opler, the editor of this volume and Professor of Social Psychiatry at the University of Buffalo, when he states that unlike conventional psychiatry which focused upon the individual case, "Social psychiatry is . . . interested in the larger vista of people around the world and even in remote places as a massive laboratory for the study of the relations of culture to mental health and illness according to various designs for living."

Social psychiatry, it seems, encompasses all behavioral sciences; it does, however, not draw explicitly on history. Whether this omission is the result of the fact that the historian has as yet failed to take his place among the social sciences or whether social psychiatry is too new and as yet not fully developed as a discipline is difficult to tell. It is certain, however, that the field, as it is represented by this volume, could gain in depth and perception if history were able to give it an additional perspective. Indeed some of the contributors go beyond the contemplation of the present scene and deal with the historical phenomena that have shaped each culture and explain its stresses. Among these William Caudill's "Observations on the Cultural Context of Japanese Psychiatry," Tsung-Yi Lin's study of "Delinquent Youth in Chinese Culture," and Morris Carstairs' "English Study" are excellent examples of the added values which are conferred on the study by an historical approach.

Although structurally this volume might not appear to be immediately pertinent to the medical historian, it is actually of considerable importance since, if carefully evaluated, many of its chapters furnish analogical insight

into the mental attitudes of early primitive societies. Beyond that, its panoramic view of the similarities and differences of behavior patterns in health and disease is as exciting as it is instructive. The editor must be congratulated for his conception and execution of this ambitious undertaking as well as for his own contributions to the text of the work. The individual chapters are, without exception, excellent analyses; so vast, however, is the totality of thought and facts introduced that it defies detailed criticism and review.

J. O'M. Bockris, Ed. *Modern Aspects of Electrochemistry*. Vol. 2. New York, Academic Press, Inc.; London, Butterworths Scientific Publications, 1959. ix, 416 pp. $13.

Reviewed by Bern Dibner, *Director, Burndy Library, Norwalk, Connecticut.*

It is a measure of the increased tempo of modern science when a text such as the above has to be revised in the short span of five years. The designation of "No. 2" indicates that this is a modernized version of the original issue of 1954, and it is also an indication that more numbers are on the way.

This is a textbook in a field of science and technology not only of growing importance but also one that is spreading its influence into many other areas of science. The science of electrochemistry is no longer confined to the expanding branches of physical science, for it is assuming increased importance in the biological sciences and in medicine as well.

Electrochemistry is a science having its absolute beginnings with the announcement by Volta of a means of generating an electric current by chemical means in an epochal letter to the Royal Society in 1800. The book under review attests to the recent part played by electrochemistry in the most advanced aspects of technology and research. A full chapter is devoted to the problems of interionic attraction in solution and its projection into the theories of concentrated solutions. Another chapter is concerned with ion exchange. A third chapter treats of molten electrolytes, so important in the processes of electrolytic extraction in metallurgy and in the purification of elements, as well as their application in nuclear reactions. This chapter on molten electrolytes is the most extensive in the book and, because of its bearing on atomic technology, probably its most important.

The penultimate chapter concerns the anodic behavior of metals and is concerned with the anodic processes at electrodes. In this discussion, fundamental investigations of corrosion and the behavior of film growth and film instability are treated. The final chapter is concerned with the electrochemistry of semiconducting compounds, a field that is new and of very great promise. The editor of this gathering of related chapters is professor of chemistry at the University of Pennsylvania, and he helped in the preparation of the third chapter. The other authors were drawn from the Universities of Rostock, London, and Auckland, attesting to both the uni-

versal character of this advanced phase of physical chemistry and also to its broad integration. The very full bibliography at the end of each chapter further illustrates the continued melting of political borders in science.

RUDOLPH NISSEN AND ROGER H. L. WILSON. *Pages in the History of Chest Surgery.* Springfield, Illinois, Charles C Thomas, 1960. vii, 166 pp. $7.50.

Reviewed by GUSTAF E. LINDSKOG, *William H. Carmalt Professor of Surgery, Yale University School of Medicine.*

THIS diminutive but attractive volume comprises only 166 pages, of which more than half are devoted to illustrations and bibliography. The senior author states in his preface that the origin of his text was the Mitchell Banks Memorial Lecture delivered by him at the University of Liverpool in 1933. Viewed as a series of talks on certain historical aspects of thoracic surgery, this book constitutes a pleasant diversion. Considered, however, as a monographic treatment of the subject it leaves much to be desired. Brevity is not then a virtue, because many areas of historical interest receive no mention or only a cursory sentence or two. The latter is the fate, for example, of Chevalier Jackson and bronchoscopy, even Wilhelm Roentgen and the x-ray. The interesting story behind the development of iodized oil bronchography rates a single sentence.

Within the narrow limits set by the brevity of the text, the delicate matter of individual priorities seems to have been skillfully handled for those subjects which are considered. However, in the chapter on pulmonary resection there is no notice in either text or bibliography of Robertson's five early lobectomies for bronchiectasis, as published in 1917; Blades and Kent receive no mention for their early demonstration of the technique for anatomical dissection in the lobar hilum. While the broad general picture of developments in thoracic surgery as related to the basic sciences was being sketched, the basic anatomical work of Boyden and his school on the bronchovascular segments should have received some recognition, however brief.

The authors state in the leading sentence of the chapter entitled "Surgery of the Esophagus" that the surgical approach to diseases of the esophagus was perhaps the starting point of thoracic surgery. It is true that the interest of von Mikulicz in the problem of esophageal carcinoma was an important stimulus for Ferdinand Sauerbruch's early experiments at Breslau with open thoracotomy using his cumbersome negative pressure chamber. Sauerbruch was, of course, the mentor of Professor Nissen in the early part of his career as a thoracic surgeon. But a little reflection makes it seem clear that thoracic surgery, and much else in surgery, had its roots deep in the experience with trauma, slowly and painfully accumulated through many centuries.

The greatest value of this little book appears to us to lie in the splendid illustrations and the many excellent photographs of those who pioneered

in the frontiers of a growing specialty. Some are original and character-revealing portraits and all are interesting. In addition, the authors had the happy thought to reproduce the title-page or specimen text pages of classical or early contributions to the literature. The Charles C Thomas Company, with its high standards of press work and book making, has reproduced these illustrations so faithfully as amply to justify the addition of this book to any library.

ZACHARY COPE. *The Royal College of Surgeons of England.* Springfield, Illinois, Charles C Thomas, 1960. xii, 360 pp., 78 figures. $13.00.

Reviewed by FRANK GLENN, *Surgeon-in-Chief, The New York Hospital, Lewis Atterbury Stimson Professor of Surgery, Cornell University Medical College.*

THERE is great pleasure and considerable profit to be derived from an accurate account of one's predecessors, supplemented by a gallery of contemporary portraits, regardless of individual achievement. No recent book dealing with surgery so completely justifies this contention as Zachary Cope's *History of the Royal College of Surgeons of England.* It is the story of medicine's evolution into its present-day specialties, with emphasis of course on those related to surgery. Beginning with the cleavage of the barber-surgeons into the Company of Barbers and the Guild of Surgeons in the 15th century, the author, one of Britain's most articulate surgeons, circumstantially but concisely traces the development of English surgery into the 20th century.

Ever mindful of significant social, economic, and political changes so intimately associated with the growth of the science of medicine and surgery, Cope presents the problems that confronted his forebears and the solutions evolved to meet them. Through the years the Council of the College, made up of members with variant capabilities and diverse interests, is credited with being constant in its objectives to advance surgery through research and establish specific requirements of those preparing for recognition in this field. At the same time the Council strove to make available facilities for institutional training. This pattern for advancement of the professions in science, so widely accepted today, is described as being well on its way to full development in England in 1865. These accomplishments were attained not without some resistance in the form of local and violent reaction. As late as 1920, it is related, a candidate informed of his failure in examination for membership, fired six revolver shots in the Union Hall of the College, threatening the life of an attendant.

The influence and the relationship of the College to the development of the biological sciences and medical organizations elsewhere emerge from the broad base of these historical data, emphasizing the magnitude of its contribution. To illustrate this, two examples merit mention. The first, and it will be of interest to every student of medicine—particularly those of

surgery—provides first-hand information about incorporation of the Hunterian Museum into the College in Lincoln's Inn Fields. The genius-inspired Hunter had worked unceasingly for 30 years (1763-1793) to collect, prepare, and describe this vast amount of scientific material. Until it became a responsibility of the College, only a few recognized its significance or appreciated the influence it was to have upon the medical sciences. An example of its importance, however, was the opportunity it afforded Darwin to accumulate data supporting his theories published in 1858. The path from comparative anatomy to genetics will whet the appetite of the bibliophile who enjoys speculation.

The second example relates to the influence upon and the friendly association of the Royal College of Surgeons to American surgery. Beginning in 1900, Keen of Philadelphia and Warren of Boston were made honorary members. In 1913, Sir Rickman Godlee, then president of the English College, gave an address at the Inauguration of the American College. Following World War I, Lord Moynihan, in 1920, further cemented this relationship between the two Colleges by presenting to the American College of Surgeons a ceremonial mace that is much prized and always in evidence at the annual convocation. Even more far reaching in furthering friendly relations were the efforts of Lord Webb-Johnson who led the rebuilding of the College in the wake of its near total destruction during World War II. There were many other surgeons who, as officers, council members, and contributors to the College, evoked the admiration and deep affection of their American colleagues. Among the many participating in recent mutual endeavors and common interests are such individuals as Lord Webb-Johnson, Lord Salisbury, Sir Gordon Gordon Taylor, Sir Cecil Wakeley, and Sir James Paterson Ross.

Cope's lucid and vivid description of persons and events in the history of the Royal College of Surgeons of England is a delight to read. While this enjoyment is greater perhaps for the older surgeons, whose associations with their English contempories are of long standing, the book nevertheless offers an instructive and pleasant means for more youthful surgeons to become better acquainted with a segment of the profession with which they have much in common.

Encyclopédie de la Pléiade. Histoire de la Science. Paris, Librairie Gallimard, 1957. (Published under the direction of Maurice Daumas.) xlviii, 1,904 pp., 30 figs. and illus.

Reviewed by RHODA RAPPAPORT, *Reid Hall, Paris, France.*

THE difficulties inherent in writing a comprehensive survey of the history of science make the appearance of such a work a rare and noteworthy event. Ideally, one dreams of a volume of manageable size which would combine thoroughness with balance, scholarship with readability. All these qualities

are present to a remarkable degree in the Pléiade *Histoire de la Science*, a collaborative effort directed by Maurice Daumas.

A handsomely produced volume, the *Histoire de la Science* is also a carefully designed structure, beginning with a preface in which Daumas discusses the nature of the field—as an intellectual discipline and a new academic one—and outlines its history from Fontenelle to George Sarton. Succeeding chapters treat "La vie scientifique" from earliest times to the present, science in antiquity and the middle ages, the 17th-century revolution in thought, and the histories of the separate sciences. Each section is the work of one or more scholars and is followed by a basic bibliography. A synchronous table, lengthy index, and analytical table of contents complete the book's apparatus.

Several new features distinguish this volume from its predecessors and thus deserve special notice and commendation. The preface is one of these, as is Daumas' introductory essay, aptly called "La vie scientifique," which details the changing conditions under which scientists have worked and communicated, both with one another and with their public. This chapter provides an excellent setting for the whole of the volume.

An equally welcome departure from precedent is the considerable space devoted to such fields as mineralogy, geography, and geodesy. Along with the intermittent commentary on the progress of technology, these sections form a useful supplement to the histories of the more familiar sciences.

The final section of the volume traces the growth of the sciences of man: anthropology, ethnography, sociology, demography, and psychology. While their early development (before 1750 or 1800) might better have been combined into a single chapter on intellectual history, it is nonetheless time that these younger disciplines were included with the older sciences to whose progress they have often been closely linked.

Inevitably in a collaborative work of its size, scope, and novelty, the *Histoire de la Science* suffers occasionally the defects of unevenness and—if the term is suitable—fragmentation. The bibliographies are of varying quality and usefulness. (The English reader will also note the predominance of French references and the omission of such classics as Lynn Thorndike's *History of Magic and Experimental Science.)* More fundamental, however, is the striking variation in the methods of exposition used by the contributors. For the most part—with the notable exceptions of the late Robert Lenoble's account of the Aristotelian physics of 1600 and the brilliant section on physics and chemistry by Daumas and Rodolphe Viallard—little attempt has been made to discuss the problems which have confronted each of the sciences. The great Newtonian revolution, for example, must be sought in the chapters on mathematics, astronomy, and physics; and for its impact on the philosophical and popular levels, the reader is sent on to still other pages. It is even more difficult to find any summary of the questions preceding and stemming from the *Origin of Species:* the geologic time-

scale, the evidence for organic evolution, the arguments of anti-evolutionists, and the eventual contributions of paleontology, biology, and anthropology toward the confirmation of the Darwinian hypothesis. While the narrative illustrates the irresistible progress of the sciences, some pause for summary and reflection would show that progress has been accompanied by widespread debate and excitement.

Questions of relative emphasis are often a matter of personal judgment, but it seems pertinent to ask if Cartesian influence has not been overstated at the expense of post-1650 Baconianism, or if the originality of Darwin's synthesis has not been understated in favor of Lamarck's role as a precursor. To the omissions and minor slips noted by an earlier reviewer might be added: reference to Priestley as "John" instead of Joseph (p. xv), incorrect citations of the titles of *The Method* of Archimedes (p. xxiii) and of Voltaire's *Eléments de la philosophie de Newton* (p. 110), Newton's two birthdates, reconcilable by reference to the old and new style calendars (pp. 581, 755), and the striking omission of all reference to the history of decimal fractions.[1]

Despite its limitations, the *Histoire de la Science* is a valuable reference work and an eminently readable presentation of a difficult subject. If its faults have been stressed here, its numerous virtues have not been overlooked. For both the specialist and the novice, there is a great deal of information, many original insights, and much pleasure to be found between its covers.

R. HOEPPLI. *Parasites and Parasitic Infections in Early Medicine and Science.* Singapore, University of Malaya Press, 1959. xiv, 526 pp., 23 plates. $25.00.

Reviewed by HAROLD W. BROWN, *Professor of Parasitology, Columbia University, College of Physicians and Surgeons, New York 32, New York.*

THE author, who is a world-known parasitologist, writes broadly on his subject from an extensive parasitological training and experience as well as his medical background. He served as professor of parasitology at Pekin Union Medical College for nearly a quarter century and recently as Visiting Professor of Parasitology, University of Malaya.

The book is concerned not only with fundamental problems of parasites and parasitic infections but with many general biological phenomena and health in general. The first section of the book deals with the history of early parasitological beliefs and studies. The literature of the world at large, beginning in the year 1200 A.D., is explored and is succinctly reported. The struggles with spontaneous generation, mistaken beliefs of the

[1] Cf. review by G. Canguilhem, in *Archives Internationales d'Histoire des Sciences,* janvier-mars 1959, pp. 76-82.

untutored, armchair pontificants with their pompous platitudes, hard-headed thinkers, and occasional clever experimenters are all present. There is a wealth of history, some of which at times dims the brilliance of one's personal heroes. For example, Jenner, who acquired lasting fame by his work on the habits of the Cuckoo bird and smallpox vaccination, promulgated the belief of the transformation of hydatid cysts into tuberculous tissue.

The second section of the book reviews the history of Chinese medicine as related to malaria, dysentery, leeches, anthelmintics, scabies, and lice. We are also taken to Borneo, Malaya, Fiji, and Tahiti to learn about the beliefs of present-day primitive people on the origin and treatment of parasites. The effect of the moon on biology and medicine, according to early man and his present-day primitive counterpart, illustrates how little education in parts of the world has progressed.

The third section of the book is an all-too-short résumé of the two hundred years of increase in our parasitological knowledge, ending in 1850, during which time the experimental method was introduced.

This is an excellent reference book with a great wealth of material which is not readily available and, in the case of Chinese literature, often unavailable. A most extensive bibliography makes this a volume of inestimable value. Biologists, parasitologists, physicians, and all persons with an interest in medical history will enjoy this book.

G. C. ANAWATI. Tarīkh al-ṣaidalah wa-al- 'aqāqīr fī al- 'ahd al-qadīm wa-al-'aṣr al-wasīt. (French title: Drogues et Médicaments dans l'Antiquité et de Moyen-âge) Cairo, Dar Al-Maaref, 1959.

Reviewed by MARTIN LEVEY, *Research Associate, Department of History of Science and Medicine, Yale University.*

To the medical science of the Greeks, Indians, Egyptians, and Babylonians preceding them, the Arabs added many observations in a systematic fashion. The Muslims also described certain ailments unknown to their predecessors, as smallpox for example. However, in pharmacology and pharmacognosy, Islamic scientists surpassed the Greeks and Latins by developing this science to great heights in a thoroughly original way.[1] It is therefore worthy of considerable investigation to determine the extent of Muslim contributions to pharmacology, its development, and its influence on its successors.

This little booklet (209 pp. in Arabic, 4 pp. in French) is a very useful account by an Egyptian pharmacist of Babylonian, Egyptian, and Arabic drugs and their history. It is based on lectures given by the author in the Faculty of Pharmacy of Alexandria; the lecture material was expanded to make up the present volume.

[1] Holmyard, E. J. *Proc. roy. Soc. Med., Sect. Hist. Med.*, 1935, 29, 99-108.

First, it is important to give occidental readers a brief account of what is contained in the various divisions. Chapter I discusses the relations of magic and drugs. "Little by little is the art of healing, based on observation and experience, separated from superstitious practices which accompany magical prescriptions." Sumerian and Akkadian drugs are treated briefly in the second chapter. It is based, according to the author, almost entirely on the work of René Labat. Material from the Egyptian papyri is considered more fully in the next chapter. Here, Anawati includes a list of drugs of this region, a discussion of the sources of our medical knowledge, an outline of the important papyri and their dates, Egyptian diet and health, public hygiene, the materia medica, and methods and materials in embalming.

Chapters IV, V, and VI are devoted to Hippocrates and the Hippocratic school, Dioscorides, and Galen. In each of these, the titles of their works are given in English and Arabic. From Dioscorides' materia medica, a list of all the materials used is given in Arabic and Latin. This work is based on the Dubler edition which is not the best.

This brilliant Greek heritage passed from Alexandria, Rome, Pergamon, Jundishapur, and other great scientific centers to the Islamic civilization in the 8-9th centuries. One of the greatest figures active in this work was Ishaq b. Hunain. Chapter VII is devoted to him. The next chapter discusses some great writers of the Arabic period such as al-Rāzī, al-Majūsī, ibn Sīnā, ibn Maimūn, and ibn Baitār. Two others are discussed who had an enormous influence on Arabic pharmacy, Kūhīn al-'Attār (13th cent.) and Dāwud al-Anṭākī (1599). A last chapter of interest to historians of pharmacy is concerned with the part of Muslim governments in official surveillance of the pharmaceutical field in regard to fraud, the common ersatz products, and the general control and sale of drugs.

A selective bibliography in Arabic and European languages is given. For the beginner in the field it should prove a highly useful one.

The strongest part of the book is that on Arabic drugs and materials. There are valuable bibliographical notes in these chapters. Of great importance is the useful habit of the author in giving the English equivalent for many Arabic technological terms as they are mentioned in the text.

The discussion is somewhat too brief in those sections devoted to al-Rāzī, al-Majūsī, and a few others. This volume is not meant, however, to cover the entire field although it is excellent as a brief review of Arabic knowledge of drugs and medicaments. Because of its briefness, perhaps, the Egyptian, Babylonian, Syriac, Indian, and Greek works have been inadequately covered. As a result, there is a lack of perspective in the treatment, with Arabic pharmacology suffering in that it is insufficiently explained. M. Anawati is to be commended, nevertheless, for his attempt to give the story of early drugs in a very readable fashion. His book is worthy of a place in all medical and history of science libraries.

CARLO CASTELLANI. *L'attività Clinico-Medica di Cesare Magati.* Milano, Edizioni Stedar, 1959. 114 pp.

Reviewed by GEORGE MORA.

CARLO Castellani, the author of some previous studies on Cesare Magati's contribution to medicine, offers in this neatly printed monograph the translation of Magati's *Consulti,* which was known only in the history of surgery (especially after the study by Dr. Giordano, 1935), because of his treatise *De rara medicatione vulnerum* (1616), in which he anticipated some concepts of modern antisepsis.

The present study, though limited to Magati's 16 *Consulti,* throws further light on the picture of clinical medicine of the early 17th century, a period particularly significant in the history of science. Magati is, in fact, a contemporary of Descartes, or Della Porta, of Galilei, of Bacon, of Harvey, of Sanctorius, of Van Helmont, and slightly precedes Borelli, Sylvius, and Sydenham. He is far from the stature of these great men and of their accomplishments, but it is well to remember that the status of surgeons of that time could not have been compared to that of leading clinicians.

Even so, his personality reflects without any doubt the spiritual climate of the time, namely, the fresh enthusiastic approach toward science coupled with, if not dimmed by, the indisputable recognition of Hippocrates, of Galen, and of the Arabs. As pointed out by Castellani in his historical introduction, one feels that beneath the formal compliance to such traditional authority there is already a new spirit foreshadowing modern medicine. But times were hard for innovators in Padua, Pisa, and in Ferrara, the aristocratic Renaissance city run by the powerful d'Este dynasty, where Magati spent most of his life. Even more powerful, and more directly influential on science, was the Counter-Reformation in Italy. These conflicts are reflected in the life of Magati who—after becoming the personal physician of Alfonso IV d'Este—entered the religious order of the Capuchins in 1618. Very little is known of him as a man. One is left with only a few hints here and there through the *Consulti* about Magati's personality. The fine clinical descriptions, the differential diagnosis (as in the case of a uterine tumor), the anticipations of the transmission of congenital syphilis, the correlations between pathological and clinical findings, are all indications of his talent and skill as a clinician. If the reader succeeds in isolating these insights from his insistence on the Galenic principles of warm and cold, and from his long discussions on humoral pathology and on the *materia peccans,* Magati's clinical judgment appears remarkable.

Where Magati is at his best is in the discussion of surgical cases, as in the case of gangrene of the scrotum, where he reveals the serenity and security of the specialist. But even in medico-legal cases (pp. 110-114), he shows good judgment and lack of prejudice. There are occasional passages in these *Consulti* indicative of his strong convictions regarding the antagonism between physicians and pharmacists, to the defense of the medical profession and to criticism of the treatments of other physicians.

The real spirit of the *Consulti* lies in the continuous emphasis on the patient, his discomfort and his individual reaction to stress, as exemplified by Magati's genuine sorrow for a couple's sterility or by his intuition in psychological matters.

The value of this monograph (despite the translator's awkward attempt to simulate old Italian) lies in its illustration of an unknown aspect —the medical one—of a distinguished surgeon of the past. Whether these two different mentalities, that of clinician and surgeon, persist unintegrated in Magati's personality, as suggested by Castellani, remains debatable. One would be inclined to think that Magati's farsighted views of antisepsis in surgery are related to the depth of his clinical judgment. However this may be, this study presents an interesting picture of the activity of an early 17th century practitioner.

SIEGFRIED LAUFFER. *Abriss der antiken Geschichte.* (Of the series, *Abriss der Weltgeschichte.*) München, Verlag R. Oldenbourg, 1956. 180 pp., 3 pl.

Reviewed by MARTIN LEVEY, *Research Associate, Yale University School of Medicine.*

THE historian frequently has use of a handy chronology to give him a quick picture of various events which occurred in a brief period of 5-10 years or less. When these are given in brief succession by name or title, it serves to raise a picture which refreshes one's historical perspective.

This volume, one of a series covering world history, starts at 1200 B.C. and goes to 395 A.D., and is devoted almost entirely to Greece and Rome. Essentially, political and cultural history are covered in the main body of the work. The data listed give a reasonably full view of what transpired in the Greco-Roman world. Very little is given of the other contemporary civilizations.

There are two appendices of interest to historians of science. One is on the science and technology of the period by Friedrich Klemm. Unfortunately, the highly abbreviated nature of this section makes it of limited use to historians of science and medicine. The remaining appendix is on Greco-Roman music by the musicologist Karl Gustav Fellerer.

An excellent and lengthy index of 32 pages is included together with a king list from 305 B.C. to 395 A.D. and also succession lists of the Ptolemies and the Houses of Seleucus, Julius-Claudius, and Constantine. Maps of ancient Greece, Rome, and the entire Mediterranean are very helpful.

W. J. BISHOP. *The Early History or Surgery.* London, Robert Hale Limited, 1960. 192 pp., 21 figs. $4.00.

Reviewed by JAMES B. D. MARK, *Instructor in Surgery, Yale University School of Medicine, New Haven, Connecticut.*

OF the many books about the development of medicine through the centuries, *The Early History of Surgery,* written by the British medical histor-

ian, W. J. Bishop, certainly deserves notice as one of the most authoritative and readable. This book is relatively short, especially for an historical volume, but Mr. Bishop has skilfully selected the significant milestones from the rocky road of medical progress and put them together in a narrative form that is comprehensive without delving too deeply into minutiae. A handy list of references "For Further Reading" is provided at the close of each chapter. A remarkably complete index is included, which greatly simplifies the use of this book for reference purposes. In addition, the book is thoughtfully, although sparingly, illustrated, several excellent and unusual reproductions being used. These, incidentally, are provided by Dr. E. Ashworth Underwood, Director of the Wellcome Historical Medical Museum, London, and include a number of rare and meaningful pictures.

The facts and facets, names and places, documents and illustrations pertaining to the development of surgery from its earliest beginnings to the latter part of the 19th century are presented in chronological order. An end-point is chosen in the 19th century shortly after the discovery of anesthesia and the principles of antisepsis in order that the reader can see the manifold problems confronting the surgeon during the preceding centuries and also have some realization of the impact these developments had on the future of surgery. A more subtle conclusion becomes ever clearer as the reader progresses and the author pin-points this fact in his concluding sentence.

> Although it is true that these great accomplishments (i.e., removal of the stomach, a lung, a brain tumor), and all the triumphs of present-day surgery were made possible by the introduction of anesthesia and antisepsis a mere century ago, every surgeon and every patient owes an incalculable debt to those masters of the more distant past who laid the foundations of the art and science of surgery.

The author points out that even in the very early days of surgery, there was a surprising degree of good surgical judgment used in selection of patients for operation, and generally an orderly operative technique. The wound, were it surgical or accidental, always received careful attention in the then current mode, although it remained for Ambroise Paré in the 16th century to rediscover many of the cardinal principles of wound care. By their very nature, surgical diseases, including trauma, were studied more objectively than the poorly understood internal diseases of medicine, and thus their treatment was less magical and more exacting. Much the same circumstances hold true even today.

Written in language which is readily understood by laymen, yet in a style which physicians and advanced students will find pleasing, this book is certain to be a popular addition to the library of those interested in the history of medicine in general and surgery in particular.

LAURITZ GENTZ. *Hur såg C. W. Scheele ut? Varför kallade han sin upptäckt av luftens huvudbeståndsdelar "Chemische Abhandlung von der Luft und dem Feuer?"* Stockholm, Sweden, 1960. 38 pp. Abstract in English. Reprinted from *Särtryck ur Svensk farmaceutisk tidskrift*, 1958, *62*, 373.

Reviewed by LEONARD G. WILSON, *Assistant Professor, Department of the History of Science and Medicine, Yale University School of Medicine.*

THIS short work is primarily a discussion of the portraiture of Carl Wilhelm Scheele (1742-1786), but it is also a vindication of Scheele, who first isolated oxygen, or "fire air" as he called it, quite independently of Joseph Priestley and somewhat prior to him. Scheele's discoveries were published in his *Chemische Abhandlung von der Luft und dem Feuer* (*Chemical Treatise on Air and Fire*) (Uppsala, 1777), a work which had been written by 1775 and was based on experimental work done as early as 1770. There has never been any doubt as to the independent nature of Scheele's work, but the priority of his discoveries was not clearly demonstrated until 1892 when A. E. Nordenskiold, working from Scheele's laboratory notebooks, established the dates of his experiments. Scheele's priority has henceforth generally been recognized by historians of chemistry writing in English. Scheele himself records that when he had almost finished writing his essay, there came into his hands the first volume of Joseph Priestley's *Experiments and Observations on Different Kinds of Air* (London, 1774), in which Priestley describes his discovery of dephlogisticated air. Priestley was interested in Scheele's work and it appears to have been at his instigation that John Reinold Forster prepared an English translation which was published at London in 1780. The liberality of this gesture was somewhat marred by the condescending and biased tone of the notes written by Richard Kirwan and added to the end of this translation. Priestley himself says of them in a letter to Kirwan, also published with this 1780 edition: "Your partiality to me is too apparent in the course of your Notes."

Gentz has also sought to show the influence of Scheele on Lavoisier, since it was Lavoisier who was asked to report to the French Academy on the contents of the French translation of the *Abhandlung*. The question of influence upon Lavoisier is, however, at once so complex and so much disputed that it is difficult to pass an opinion on this matter.

Of great interest are the illustrations of the various posthumous portraits of Scheele published in his brief biographical sketch. They are all copies of a portrait medallion struck in December 1788, by the Swedish Academy of Science. Since this medal was based upon a portrait recognized as a good likeness by men who knew Scheele, it alone can be considered as an authentic portrait of him. The portraits of Scheele usually published are revealed as gross distortions of this original medallion.

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A Mediaeval Physician's Vade Mecum

C. H. TALBOT*

THANKS to the labours of scholars and specialists in the history of medicine we now know a great deal about medical theory and practice during the Middle Ages. Most of the medical works produced by the great physicians of the time are in print, so that we are no longer ignorant of the drugs they used, the methods they employed in surgery, and their general attitude towards disease. We are well informed about the lives of the more famous figures who practised in the mediaeval period and from an examination of their libraries, which have been partly or completely preserved, we can assess the intellectual milieu in which they moved. But most of this information concerns the highly successful and celebrated doctors of those days. It concerns the physicians and surgeons who practised at the courts of popes and kings, the teachers in universities or the writers who have made some special contribution to the furtherance of the science of medicine. Of the ordinary medical man who worked in small towns and villages we know very little. It is true that from time to time we find historical documents in which mention is made of local physicians and from which we gain some insight into their social position, the fees they charged, the dangers they ran, and so on. But these provide no evidence of their competence, their standard of education, or their success in dealing with disease. All that they tell us is that such and such a man was called to treat a patient, that he was paid (or not paid) a certain amount for his services, that he died in debt or was imprisoned for a misdemeanour. This does not get us very far.

It is for this reason that a small manuscript, which came by chance into the hands of the writer, is of special interest and significance. This manuscript is, though not unique, at least of sufficient rarity to merit a detailed description, because it is doubtful if any other copies exist outside the British Museum.

Before seeing this manuscript, I had often thought that the pouches one sees hanging from the belts of physicians in illuminated manuscripts of the Middle Ages were purses for holding money. This may well be so in the majority of cases. But the frequency with which this particular article of dress was associated with physicians tended to give one the impression that money was

* London, England.

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one of the main preoccupations of the medical profession, more so perhaps than of the merchants, bankers, and usurers. The appearance, however, of the little vade mecum which will now be described does much to dispel this notion; and it is at least probable that a number of these illustrations depict, not a purse for money, but a bag or pouch into which the mediaeval physician put the book which helped him to make a quick decision about the treatment to be given to a patient.

The manuscript consists of six small pieces of parchment, measuring approximately 14 x 6 inches, folded across the middle and then folded again into three sections, so that the outward appearance shows strips each measuring 7 x 2 inches. Each of these pieces was devoted to a single element in the making of a diagnosis: A Calendar, Canons of the eclipses of the sun, Canons of the eclipses of the moon, a table of Planets, Rules for phlebotomy, and Descriptions of urine. With all these available, the physician could make rapid calculations and decide within a matter of moments what was best for the patient.

These folded sheets are tied together at the top with a piece of ribbon. From the shape of the finished pages one can assume that the manuscript was not meant to be carried in the hand, and, from the fact that it was not bound, that it was not intended for pulling in and out of a pocket; its purpose was to hang at the waist from a belt or girdle, where with a flick of the finger, the appropriate table could be opened and consulted. We have at least two illustrations of such a manuscript being used during the Middle Ages, and readers will be able to see from the examples published here that such vade mecums were by no means rare; indeed, one must infer that most physicians of the time carried one about. We already know that manuscripts in this format were made for the use of priests, monks, and friars, who carried at their waists small copies of the breviary from which, on their journeys or in their moments of leisure, they could read the psalms and hours imposed on them by their religious rules. One such manuscript exists at the Bodleian Library in Oxford; and it may be that medical men adopted this custom from the religious orders.[1]

[1] *Latin liturgical mss. and printed books,* Bodleian Library, 1952, pp. 39-40, no. 74, plate xvii. A number of manuscripts in the same format are at the British Museum, mostly calendars, but there are two which were evidently made for the use of a physician. One of them has an additional section with the *Sphera Apulei Platonis,* (cf. C. Singer, *From magic to science,* New York 1928, p. 146; H. E. Sigerist, The sphere of life and death in early medieval manuscripts, *Bull. Hist. Med.* 1942, *11,* 292) and a *Tabula ad calculandum pro futuris,* which will tell not only the weather, but also where one's lost property is and the identity of the thief.

Unfortunately, the example with which we are dealing is not complete. Three small sections have become detached and lost; but as these particular parts contained only the calendar for the first nine months of the year, it does not impair the value of the manuscript for telling us exactly what information it was which the physician liked to have at his finger tips.

The vade mecum opened with a calendar. As far as one can judge from the list of Saints' names, this reflects the use of Sarum and might presumably indicate that the vade mecum was produced somewhere in the vicinity of Salisbury. But as the Sarum calendar was widely diffused, the locality of the scriptorium in which our manuscript was written was not necessarily confined to Salisbury. It may well have been Oxford. We know that Oxford had been a flourishing centre of the book trade since the 12th century and that Cat street was the focal point of this activity:[2] furthermore, during the period in which the vade mecum was issued, small works of this kind were being mass-produced at Oxford to meet the growing demands of readers.[3] This presumption in favour of Oxford as the place of publication is strengthened by the appearance in the vade mecum of lists of eclipses with mathematical tables, based, it would seem, on the astronomical tables drawn up in the university town, for in the 14th and 15th centuries Oxford was considered much as is Greenwich today.[4] So we may take it as probable that it was at Oxford that this kind of book was made.

The date of its appearance is more easily settled. The list of times of the lunar eclipses begins with the year 1398 and continues to 1462; the solar eclipses begin with the year 1406 and end also at 1462. We may presume, therefore, that the actual writing of the manuscript took place towards the end of the 14th century or in the early years of the 15th. As there are a great number of these tables in circulation, it is not possible without more detailed study to say on which particular set of tables the lists in the vade mecum are based,[5] but we take it for granted that they are related in some way with the work of the Oxford school of astronomers and mathematicians.[6]

2 H. E. Salter, The medieval archives of the University of Oxford, *Oxford hist. Soc. Publ.*, 1920, *70*, 291, 292; T. E. Holland, The University of Oxford in the 12th century, *ibid.*, 1890, *16*, 178-179.

3 C. H. Talbot, The universities and the mediaeval library, in: *The English library before 1700*, London, 1958, pp. 71 seq.

4 R. T. Gunther, *Early science at Oxford*, 1923, II, pp. 276 seq.

5 Lynn Thorndike, Notes upon some medieval Latin astronomical, astrological and mathematical manuscripts at the Vatican, *Isis* 1958, *49*, 34-49.

6 Gunther, *Early science at Oxford*, II, pp. 42-65.

The tables of the eclipses, which are beautifully illustrated with figures painted in gold, red, and blue, are accompanied with instructions of an elementary character in the rudiments of astronomy; these notions perhaps are intended as a refresher to the memory, for according to Isidore every physician should be well grounded in this before he began a study of medicine proper.[7]

After the table of eclipses follows a table of planets with a very fine illustration in colour of the zodiac man, showing the organs of the body which are subject to the influences of a particular planet.[8] Moreover, there are further lists indicating not merely the day upon which a sign of the zodiac has power, but also the hour of the day; and by the side of these runs the series of four humours, *colera, melancholia, sanguis, fleuma,* so that one can see at a glance how the moon in passing through the various houses of the planets affects the four humours of the body. To this is attached a text warning the physician against certain operations when one or other of the planets is in the ascendant.

The next section deals with phlebotomy. Here there is a full-page illustration of the venous man, surrounded by roundels, in which the veins are described and the various ailments with which they are connected are detailed. It is followed by a short but complete treatise on blood-letting, in which the teaching of the accredited masters is briefly expressed.[9]

Then follows the ring of urines, very beautifully drawn and coloured, with precise rules both about the significance of the various colours of urine and the interpretation which should be placed on them. This brings to an end the vade mecum.[10]

It will be seen, therefore, that within a small compass there was contained all that a mediaeval physician was likely to need when he first called to see a patient. Detailed treatment with drugs or surgery would no doubt follow in the cases of serious illness; but for a quick diagnosis and a superficial alleviation of symptoms, the vade mecum would supply all his immediate needs.

[7] Isidore of Seville, *Etymologiae.*

[8] Sudhoff, *Stud. Gesch. Med.* 1914, *10,* 199-200 and plates lx-lxv. Considering the bitterness with which these ideas had been attacked by Augustine, *De haeresibus* c. lxx, Patrologia Latina XLII, col. 44, and condemned in 563 by the Council of Braga, it is astonishing that they survived. The maxim *Cave* can be traced back to the Ceniloquium of Pseudo-Ptolomaic origin (K. Sudhoff, Iatromathematiker vornehmlich im 15. and 16. Jahrhundert, *Abh. Gesch. Med.,* 1902, Hft. 2, 7 seq.).

[9] See the appendix by O. Kurz to F. Saxl's article, A spiritual encyclopaedia of the later middle ages, *J. Warburg Courtauld Inst.* 1942, *5,* 138-142.

[10] Gunther, *Early medical and biological science,* 1926, p. 25, where he gives a number of other Oxford MSS., containing this illustration.

One's first impression of delight at examining so beautiful a piece of work is quickly tempered after considering its content. Here, four centuries after the first appearance of the Salernitan treatises on medicine, we find the same doctrines, the same outlook, the same elementary rules of diagnosis, without the slightest step forward. One can relive with this vade mecum in one's hands the exact situation described so vividly in the anonymous *De adventu medici ad aegrotum*: the easy assured entrance to the sick man's room, the greetings to those around the bed, the taking of the pulse, and the confident promises of recovery.

> Then have the patient's urine brought to you, so that the sick man may know that you understand his illness not merely by his pulse, but also by his urine. In the urine look intently at the colour, substance, quantity and content, and afterwards promise the patient health with the help of God.[11] . . . In bloodletting notice the time of the onset of the illness, the time of the year, the strength and age of the patient: and from the beginning of autumn to the beginning of spring take blood from the left arm, but from the beginning of spring from the right. For illnesses connected with the brain cut the cephalic vein; for diseases of the spiritual parts (i.e., lungs, etc.) the median; for diseases of the digestive tract the basilica. And when you have finished bleeding the patient, give him a sense of security.[12]

All these old phrases come rolling out once more, like a lesson learned in childhood, from the pages of the vade mecum. All the astronomical and planetary lore, the rules for phlebotomy, the uroscopy and everything else have passed on unchanged, so that one almost gets the impression that the practice of medicine has been reduced to a formula.

But one must not be too critical and unsympathetic. If it is viewed against the background of popular medicine, of charmed potions, amulets, magical incantations and the like, this astrological medicine presents an aspect of precise and coordinated knowledge based on an accurate, determined, and predictable order of the heavens. It was "scientific" in the sense that it was based on principles handed on from classical times. These principles stated that man was a microcosm composed, like the macrocosm, of four primary elements (earth, air, fire, and water) and qualities (heat, cold, moistness, and dryness). His characteristic nature and individual temperament (sanguine, choleric, phlegmatic, or melancholic) arose from the predominance of one of his four constituent and vital fluids. Indeed, his entire physical make-up corresponded to a sympathetic relationship with the celestial

[11] S. de Renzi, *Collectio Salernitana*, II, pp. 74 seq. Trans. in G. W. Corner, The rise of medicine at Salerno in the twelfth century, *Ann. med. Hist.*, 1931, 3, 6-7.

[12] *Ibid.*, p. 75.

spheres, the zodiac (or exterior belt) governing his outward anatomy, the planets (or inner circles) dominating his inner organs.[13] Of all the planets, the moon, which was closest to the centre of this anthropocentric scheme, had the greatest influence on terrestrial fluids (i.e. the tides) and consequently was the cause of the increase or decrease in man of the humoral fluids.[14] The pathology which issued from these general principles, therefore, regarded illness primarily in terms of the disturbance of a man's humoral balance. As one method of correcting this disturbance of the humours was phlebotomy, this naturally took pride of place in medical treatment, and as a result tables of reference were incorporated into the physician's books as a practical necessity.[15] As he could not memorize the changing phases of the moon, signs, and planets, and as, without them, strictly correct treatment was impossible, he had to depend on these complex calendrical tables, reduced to as simple a form as possible.[16] When the system was at its best, during the late 14th and early 15th century, exact calculations by precision instruments, similar to those of astronomers and navigators, were employed.[17] This applied not merely to bloodletting, but also to general medicine and hygiene, particularly as regards purging, bathing, medication, and surgery. How deeply rooted these ideas are in human nature can be judged by their survival even to the present day.[18]

But this sympathetic evaluation of mediaeval ideas cannot blind us to the fact that the competence and the limitations of the ordinary physician are blatantly exposed by the existence of the vade mecum here described. It enables us to assess in better perspective the actual treatment meted out to patients, in contradistinction to the theories and ideals expressed by the great writers in their works. There were, undoubtedly, men of considerable skill

13 Lynn Thorndike, *Science and thought in the fifteenth century*, New York, 1929, pp. 46, 56.

14 P. Saintyves, L'influence de la lune sur les maladies d'après les médecins astrologues des origines au XV siècle, *Hippocrate*, 1934, 2, 289-313.

15 It was so widespread that it became a subject of civic and national concern and statutes were made requiring a doctor to consult such tables before cutting a vein; see *Ordonnances des rois de France de la troisième race*, Secouse, Ed. VIII, Paris, 1750, pp. 395-405.

16 It is no accident that one of the characteristic products of the first age of printing was calendars of this type: K. Sudhoff, Deutsche medizinische Inkunabeln, *Stud. Gesch. Med.* 1908, Hft. 2/3, pp. 227-274; *idem*, Lasstafelkunst in Drucken des 15 Jahrhunderts, *Arch. Gesch. Med.* 1908, *1*, 219-288.

17 See the example illustrated in Gunther, *Early science at Oxford*, II, p. 170; some manuscripts have a volvella with adjustable parts, as B.M. Egerton 2572 and the Guild Book of the Barber Surgeons of York, fol. 51.

18 E. Wickersheimer, La médecine astrologique dans les almanachs populaires du siècle, *Bull. Soc. franc. Hist. Méd.* 1911, *10*, 26-39.

Fig. 1. External appearance of the vade mecum.

FIG. 2. The Zodiac Man.

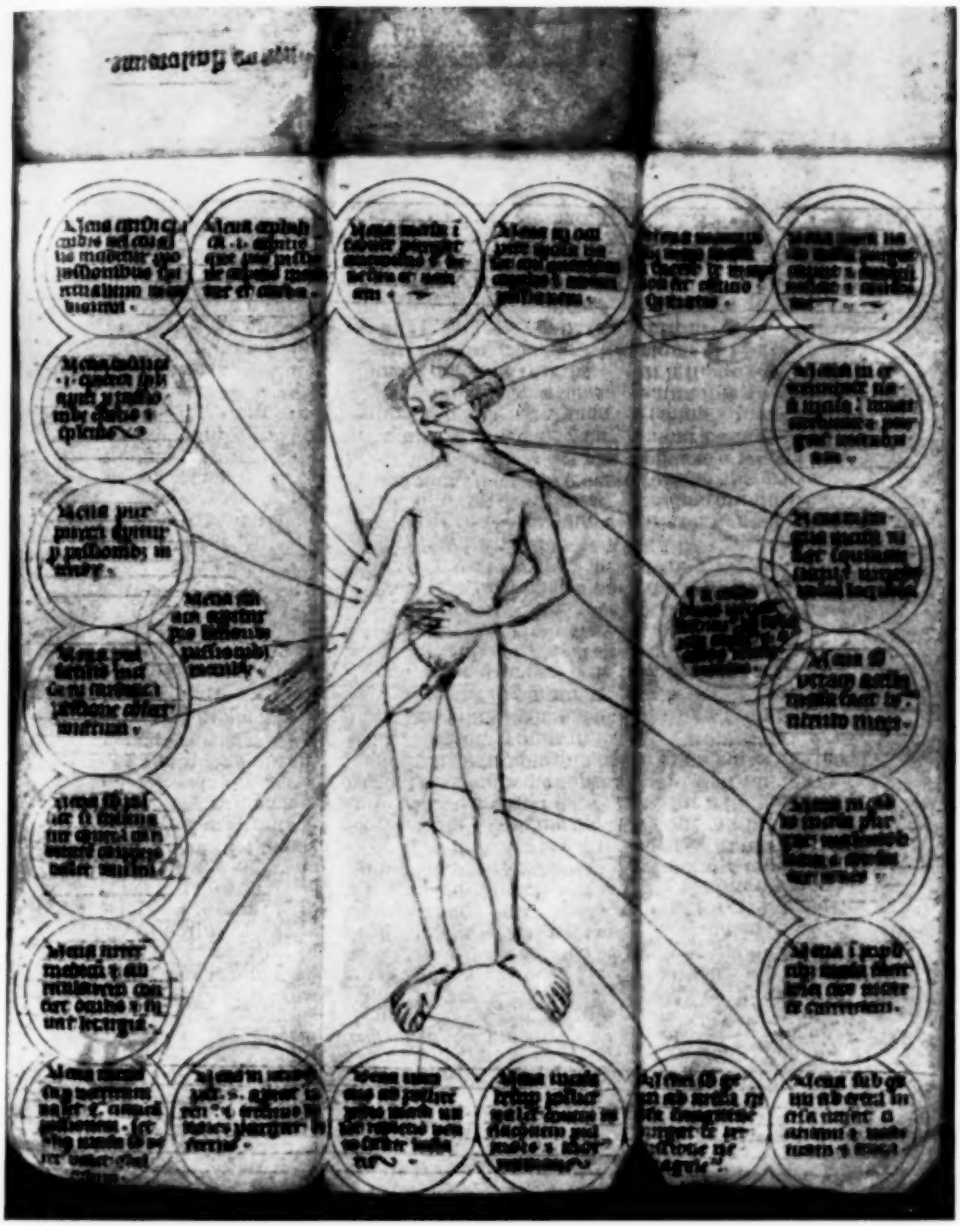

Fig. 3. The Venous Man.

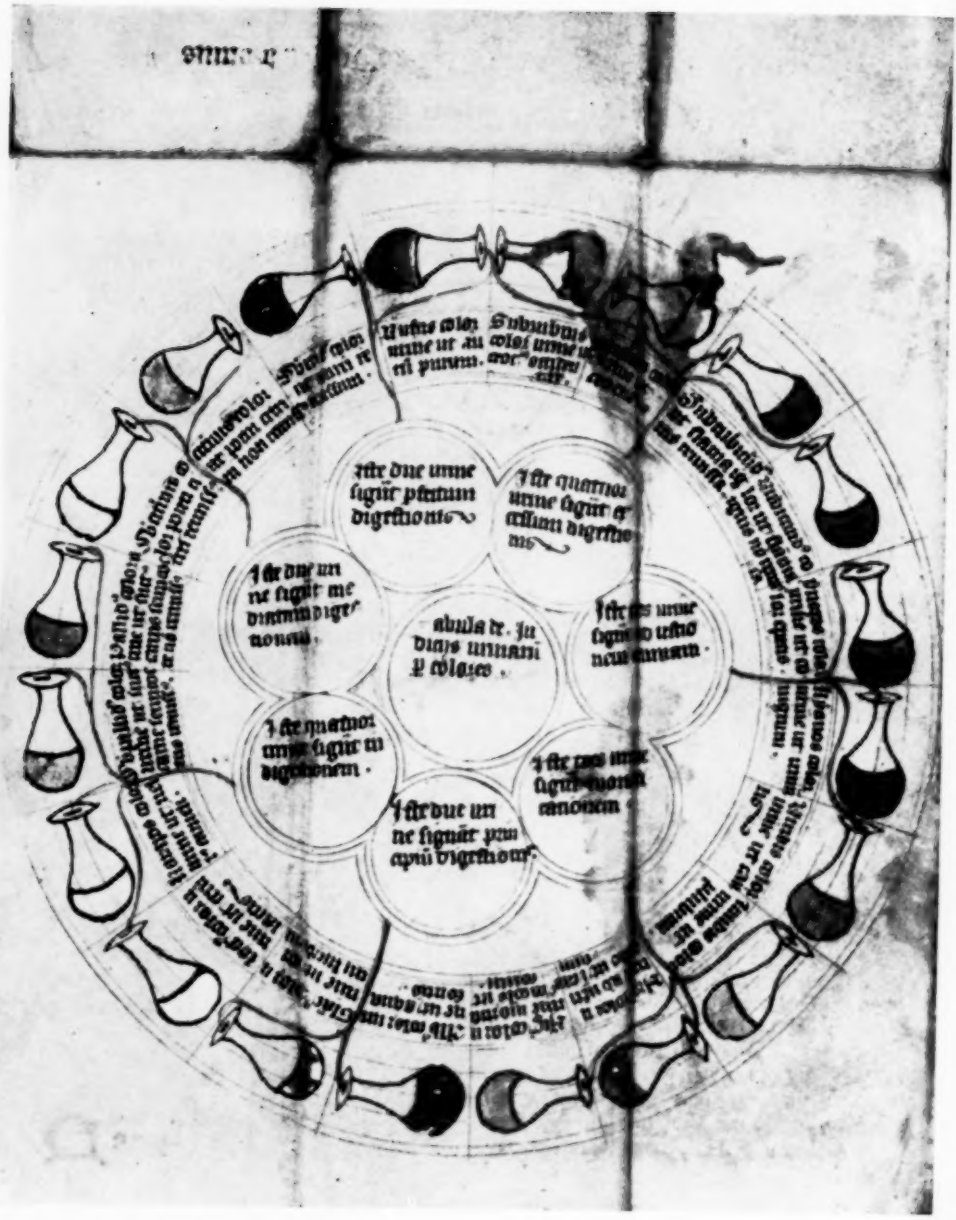

Fig. 4. The Ring of Urines.

and intellectual attainments in those days, men whose names are deservedly remembered in the annals of medical history. But if the present vade mecum is any indication of the cultural level and medical knowledge of the ordinary practitioner, we cannot afford to harbour any illusions. He needed all the *cautelae* Arnold of Villanova was able to give him.

Eclipses Lune Cum Canone[19]

Secuntur figure eclipsuum ubi supra quamlibet figuram ponitur tempus principii eclipsis quod erit eodem die uel ante mediam noctem proximo sequentem tot horis et tot minutis post meridiem si hore cum minutis ibi posite pauciores fuerint.

Si uero hore cum minutis ibi posite plures sint 12, incipiet eadem nocte eclipsis lune uel in crastino eclipsis solis tot horis et minutis post mediam noctem quot fuerint hore cum ab eis ablate fuerint hore 12.

Circa figuram uero in prima parte notatur quantum de dyametro solis uel lune eclipsabit.

Est enim eorum dyameter in 12 partes equales diuisa quarum quelibet uocatur punctum digitus uel una pars duodecima. punctum quodlibet in 60 partes equales est diuisum quarum quelibet dicitur unum minutum cuius 60$^{\text{um}}$ uocatur secundum.

Puncta igitur si 12 pauciora fuerint, eclipsis quidem particularis erit et lux in aliqua parte corporis remanebit: si uero precise 12 fuerint, eclipsis quidem uniuersalis erit, sed moram in umbra nullam habebit.

Si autem punctorum numerus excedat 12, corpus ipsum, etsi tantum proporcionaliter esset quantum foret si haberet tantum dyametrum quantus est ibi cum fraccionibus scriptus numerus punctorum totum esset eclipsatum, et retinens quantitatem propriam habebit in umbra sensibilem moram.

Cuius temporis medietas comuni nomine uocatur dimidium more.

In 2$^{\text{a}}$ parte figure ponitur casus in quo luna in suam uel terre incidit umbram uel excidit a sua uel terre umbra quod tempus cum tempore dimidie more in tercia parte figure posito si aliqua mora fuerit ad tempus principii eclipsis additum reddit tempus medii eclipsis ad quod si eadem addideris habebis finem eclipsis.

Duracio uero in ultima parte ponitur. Littera dominicalis eiusdem anni a sinistris sub figura scribitur. Aureus uero numerus a dextris collocatur. Et sic patebunt eclipses cum omnibus suis circumstanciis et suis temporibus, siue 5 habeant tempora siue tantum tria.

Sed utrum tota eclipsis uidebitur uel solum pars eius faciliter haberi potest comparando tempora eclipsis ad horas de Clok, in directo dierum uel noctium in kalendario figuratas, in quibus accidet eclipsis que omnia per hunc uersum possunt retineri:

Puncta, cadenti mora, duracio, tempus et hora.

[19] No treatise with this *incipit* is mentioned in Lynn Thorndike's *Incipits of scientific writings;* the final verse, however, is quite common.

ECLIPSES SOLIS[20]

Hec eclipsis incipiet anno domini 1406 post meridiem 15 diei Junii 16 hora 43 min. 29 sec.

1408 p.m.	18 Oct.	19 h.	19 m.	44 s.
1409 p.m.	14 April	1 h.	28 m.	32 s.
1411 p.m.	19 Aug.	4 h.	51 m.	56 s.
1415 p.m.	6 June	16 h.	57 m.	15 s.
1416 p.m.	19 Nov.	2 h.	39 m.	10 s.
1418 p.m.	5 April	20 h.	9 m.	34 s.
1419 p.m.	25 May	21 h.	18 m.	33 s.
1424 p.m.	26 June	1 h.	57 m.	27 s.

Third Cycle

1425 p.m.	9 Nov.	20 h.	9 m.	39 s.
1431 p.m.	12 Feb.	1 h.	18 m.	29 s.
1433 p.m.	17	2 h.	15 m.	37 s.
1436 p.m.	16 April	5 h.	33 m.	44 s.
1437 p.m.	4 April	5 h.	34 m.	55 s.
1438 p.m.	18 Sept.	21 h.	31 m.	36 s.
1439 p.m.	8 Sept.	2 h.	34 m.	30 s.
1440 p.m.	3 Feb.	0 h.	29 m.	12 s.

Fourth Cycle

1448 p.m.	28 Aug.	20 h.	16 m.	59 s.
1450 p.m.	12 Feb.	21 h.	42 m.	39 s.
1453 p.m.	30 Nov.	1 h.	25 m.	46 s.
1460 p.m.	18 July			
	the sun will rise already eclipsed			
1462 p.m.	20 Nov.	23 h.	0 m.	25 s.

ECLIPSES LUNE

1398 p.m.	24 Oct.	19 h.	43 m.	43 s.
1399 p.m.	20 April	6 h.	5 m.	59 s.
1402 p.m.	1 Feb.	16 h.	6 m.	37 s.
1403 p.m.	2 Aug.	8 h.	33 m.	46 s.
1404 p.m.	5 Dec.	1 h.	54 m.	

Second Cycle

1406 p.m.	1 July	10 h.	36 m.	22 s.
1406 p.m.	25 Nov.	8 h.	0 m.	4 s.
1407 p.m.	21 May	23 h.	30 m.	4 s.
1410 p.m.	20 Mar.	10 h.	15 m.	5 s.
1414 p.m.	5 Jan.	18 h.	3 m.	27 s.
1414 p.m.	2 July	14 h.	33 m.	10 s.
1414 p.m.	26 Dec.	3 h.	6 m.	4 s.
1417 p.m.	30 April	13 h.	19 m.	5 s.
1418 p.m.	19 Oct.	8 h.	14 m.	26 s.
1421 p.m.	17 Feb.	5 h.	35 m.	10 s.
1421 p.m.	12 Aug.	16 h.	22 m.	3 s.
1422 p.m.	6 Feb.	6 h.	26 m.	4 s.
1422 p.m.	2 Aug.	9 h.	39 m.	13 s.
1424 p.m.	5 Dec.	16 h.	48 m.	18 s.

[20] Identical tables are to be found in British Museum MS. Harley 5311 and Sloane 2250.

Third Cycle

1425 p.m. 25 Nov.	8 h. 17 m.	2 s.
1428 p.m. 23 Sept.	3 h. 50 m.	15 s.
1429 p.m. 20 Mar.	9 h. 16 m.	36 s.
1429 p.m. 12 Sept.	10 h. 40 m.	42 s.
1431 p.m. 29 July	9 h. 58 m.	23 s.
1432 p.m. 17 Jan.	2 h. 48 m.	14 s.
1433 p.m. 5 Jan.	23 h, 39 m.	31 s.
1435 p.m. 5 Nov.	14 h. 28 m.	34 s.
1436 p.m. 30 April	9 h. 12 m.	5 s.
1436 p.m. 29 Oct.	16 h. 0 m.	37 s.
1439 p.m. 28 Feb.	13 h. 16 m.	39 s.
1440 p.m. 17 Feb.	14 h. 4 m.	24 s.
1441 p.m. 27 Dec.	23 h. 18 m.	38 s.
1442 p.m. 17 Dec.	1 h. 38 m.	53 s.
1443 p.m. 6 Dec.	16 h. 57 m.	10 s.

Fourth Cycle

1444 p.m. 31 May	5 h. 56 m.	16 s.
1446 p.m. 4 Oct.	11 h. 32 m.	28 s.
1447 p.m. 31 Mar.	17 h. 2 m.	1 s.
will hardly be seen.		
1448 p.m. 12 Sept.	4 h. 50 m.	12 s.
1450 p.m. 27 Jan.	10 h. 18 m.	5 s.
1450 p.m. 29 July	4 h. 0 m.	30 s.
then the end will be seen.		
1451 p.m. 13 July	4 h. 57 m.	15 s.
1455 p.m. 1 May	10 h. 48 m.	53 s.
1456 p.m. 21 Mar.	16h. 27 m.	42 s.
1457 p.m. 3 Sept.	8 h. 22 m.	59 s.
1460 p.m. 3 July	6 h. 21 m.	47 s.
1461 p.m. 22 June	6 h. 46 m.	8 s.
1461 p.m. 17 Dec.	1 h. 38 m.	10 s.
1462 p.m. 11 June	12 h. 35 m.	21 s.

The first part tells how much of the diameter of the body will be eclipsed.

The second part tells the time of the event.

The third tells the length of the shadow.

The fourth tells the total duration of the eclipse

Tabula Planetarum[21]

In hanc tabulam planetarum intrandum est cum die in capite et cum horis in latere sinistro, in quorum concursu inuenietur quis planetarum illa hora dominetur. Habet enim quilibet planeta uel in die uel in hora ab ipso denominata singulare pre aliis dominium, sed in die suo uel in hora est ipsa eadem uirtus geminata.

Opus ergo bonum omni momento temporis inchoetur, sed malum hora Saturni uel Martis caucius euitet.

[21] The same text is included in British Musuem MS. Sloane 2250, Sloane 807 and Harley 5311.

Tabula lune nedum utilis est pro minutione, sed ut arte naturam imitante, accomodante, singula fiant suo tempore. Signum enim mobile celerem mutacionem, fixum uero stabilitatem, sed signum commune reiteraciones et rerum soluciones dicitur signare.

Oculum ergo expedit habere ad signum quod luna dicitur perambulare. Mobilia autem sunt Aries, Cancer, Libra et Capricornus, a quibus incipiantur quatuor anni tempora, scilicet Ver, Estas, Autumpnus et Hyems, quorum quodlibet sequitur signum suum et signum commune.

Vt autem signum et gradus lune prom (p) te habeantur intrandum est in capite tabule cum signo et gradu in quibus fuit ipsa coniunctio uel cum gradu sibi propinquiori minori et cum etate lune, in quorum concursu gradus ipse uel per solam addicionem excessus ad ipsum ibi inuenietur, qui illius signi correspondens erit ad quod reducent linee glauce ipsum includentes proximo transuersales.

YMAGO SIGNORUM[22]

ARIES.	Caue ab incisione in capite uel in facie et ne incidas uenam capitalem.
TAURUS.	Caue ab incisione in collo uel in gutture et ne incidas uenam in hiis locis.
GEMINI.	Caue ab incisione in humeris uel brachiis siue manibus nec aperias uenam in hiis locis.
CANCER.	Caue ab incisione in pectore uel in costis et a lesione stomachi uel pulmonis nec incidas arteriam uel uenam que ad splenem dirigitur.
LEO.	Caue ab incisione neruorum et a lesione lateris et ossium nec incidas in dorso per apericionem nec per uentosam.
VIRGO.	Caue ne incidatur uulnus in uentre nec in locis occultis interioribus.
LIBRA.	Caue ne incidatur uulnus in umbilico nec in interiori parte uentris nec aperias uenam in dorso nec ponas ibi uentosam.
SCORPIO.	Caue ab incisione testiculorum, ani et uesice, et a lesione medulle nec incidas uerenda in uiro uel muliere.
SAGITTARIUS.	Caue ab incisione femorum et digitorum nec incidas maculas uel superfluitates excrescentes.
CAPRICORNUS.	Caue ab incisione in genibus uel uenis siue neruis in hiis locis.
AQUARIUS.	Caue ne incidaris in cruribus nec usque ad cauillas.
PISCES.	Caue ne incidaris in pedibus.

[22] Contained in MSS. quoted above and also in Add. 28725.

YMAGO FLEUBOTOMIE[23]

Minucio alia fit per methatlesim, alia per anthipasim. Vt si passio sit inueterata, fiat minucio per metatlesim, si recens per anthipasim. Per metatlesim dicitur fieri, quando ex eadem parte in qua est egritudo trahitur sanguis. Per antipasim autem fit, quando ex parte contraria fit minucio.

Considerandum autem est si materia fuerit fimiosa ut in antiate: per metatlesim tunc debet fieri flebotomia. Similiter si quis punctus fuerit a uenenoso animali, per metatlesim minuatur. Et quia iuuenes habundant calidis humoribus in horis calidorum humorum debent fleobotomari. Cum igitur sanguis habundat ante terciam, et colera inter terciam et nonam, et ipsi iuuenes in hiis horis debent fleobotomari. Senes uero cum habundant frigidis humoribus et maxime malencolici, in hora malencolie, id est post nonam.

In fleobotomia quatuor sunt consideranda, scilicet tempus, consuetudo, etas et uirtus. In tempore calidissimo non debet fieri fleobotomia, quia humores sunt parturiati, unde cito exirent boni sicut mali. In tempore frigidissimo non debet fieri fleobotomia, quia humores sunt compacti in corpore et difficiles ad educendum, et cicius exirent boni quam mali. In noua luna non debet fieri fleobotomia quia corpora sunt ab humoribus euacuata, sed fleobotomia magis euacuarentur. Consuetudo dicitur esse consideranda, si senex consueuit fleobotomari: non minuet[ur] propter consuetudinem et debilitatem. Etas est attendenda quoniam ante 12 annos nullus debet fleobotomari neque senex senio constitutus; tamen sunt quid-[am] uigorosi et tales possunt minui. Virtus uero maxime consideretur, fortes enim minui debent, debiles uero minime.

Laborans ex synocha, id est nimio sanguine, uel synocho, id est ex sanguine putrefacto, statim minuatur omni tempore ubi luna fuerit in medio signi geminorum. Laborans effimera ex calida causa minuatur ex cephalica. Laborans effimera ex ieiunio uel frigiditate caueat minutionem. Laborans ex frenesi minua[tur] de uena capitis. Laborans effimera ex debilitate, minuatur cum cetis porci in naribus. Effimera est febris que durat per unum diem. Laborans ex litargia minuatur inter medicum et auricularem. Laborans ex squinancia minuatur de cephalica utriusque brachii. Laborans effimera ex apostemate, minuatur de uena ad auricularem. Laborans ex pleuresi, minuatur ex cardiaca per methatasim. Laborans ex cotidiana interpollata, minuatur de mediana. Laborans ex cotidiana ex utroque fleumate, minuatur de basilica, id est de uena epatis. Laborans ex falso fleumate cum pruritu fiat scarificatio in tibiis. Laborans ex cotidiana, minuatur de basilica. Laborans ex terciana, minuatur de uena epatis dextri brachii in estate. In hyeme uero sinistri brachii. Laborans ex febre ethica minuatur de uena mediana, id est, de uena epatis. Laborans ex quacumque ydropisi, minuatur de basilica. Laborans ex utericia, minua-

[23] This text is found in Cambridge, Trinity Coll. MS. 500, fol. 4-6v, and Gonville and Caius MS. 413, fol. 34v-36v.

tur de uena epatis dextri brachii in estate et hyeme sinistri. Laborans ex malencolia, frenesi et meinia, minuatur de uena que est in medio frontis. Laborans ex epatis calefaccione, minuatur de basilica dextri brachii in estate et hyeme sinistri. Laborans ex vicio splenis, minuatur de saluatella, id est inter medicum et auricularem in manu sinistra. Laborans ex vicio renum, matricis et uesice, minuatur de sophena, id est de uena interiori utriusque pedis. Laborans ex uentositate, minuatur de uena que dirigit ad pollicem pedis. Laborans ex partibus in ferioribus, minuatur de sophena utriusque pedis et scarificetur in tibiis. Laborans ex potagra, minuatur de basilica, postea de sophena. Laborans ex siratica passione, minuatur de sophena exteriori partis dolentis.

Nota quod luna non sit in signo geminorum quando minuatur de uenis que sunt in plicaturis brachiorum, neque eciam super spatulas uentose debent apponi.

Si sanguis exierit niger, tolle usque ad rubicundum. Si spissus, usque ad tenuitatem. Si aquosus, usque ad grossiciem. Si sanguis non potest exire clauso fleobotumine, uulnere cum digito postea subtracto, subito cum impetu exit sanguis.

Explicit

Anglorum regi scripsit tota scola Salerni.[24]
Si uis incolumem si uis te reddere sanum
Curas tolle graues, irasci crede prophanum.
Parce mero caue non predico uanum.
Surgere post epulas, sompnum fuge meridianum.
Mincturam differre caue nec cogeris anum.
Quantum uis sume de mensa tempore brume.
Temporibus ueris, modice prandere iuberis.
Nam calor estatis, dapibus nocet immoderatis.
Autumpni fructus extremos dat tibi luctus.

Fleobotomia mentem sincerat,[25] memoriam prebet, uesicam purgat, serebrum exsiccat, medullam calefacit, auditum aperit, lacrimas stringit, fastidium colit, stomacho proficit, sensum dirigit, digestionem inuitat, leniorem uocem producit, fugat sompnum, anxietate caret, proprium sanguinem nutrit, extraneum eicit, longiorem uitam ministrat. Incatesuras et collecciones et pestiferas [valetudines] et reumaticas passiones deponit dolores, febres et uarios morbos curat, caligines urinarum et turpitudinem tollit.

Si quis male fleobotomatus fuerit folia iusquiami in oleo madefacta calida apponat uel super[po]nat.

Cataplasmus ad tumorem brachiorum que per negligenciam fleobotomie contingit, farinam triticiam cum melle et lacte commiscens per triduum cathaplasmabis, et si tunc non fuerit sanatum brachium sursum

[24] Cf. *Flos medicinae*, lines 1-6, 362, 359-361, in S. de Renzi, *Collectio Salernitana*, V.
[25] This passage is based on S. de Renzi, *op. cit.*, II, p. 412: translated by G. W. Corner, *op. cit.* pp. 6-7.

suspen[den]s oleo calido et manibus calidis subtiliter trahendo ungues a manu usque ad spatulas et acellas sepe id faciendo.

Cura Venarum Incisarum

R/folium rute in oleo laurino coctum et brachium uel locum lesure inunge. uel sic: R/ fabam coctam in uino donec resoluatur addens sepum quod sufficit et panno imponens calidum inde brachium ligabis. Si uena cephalica intumuerit, ex aqua et oleo fouenda est, hyeme calida, estate frigida diaquiloti imponendo.

Si mediana intumuerit folea bete cum panno et roseaceo infuso cathaplasmabis.

Aprilis undena, set Mars dat septimadena.[26]
Hec tibi si minuas, ne cassus lumine fias
In Maii meta quarta uel quinta dieta.
Si minui pateris, nunquam febre corriperis.
Mars Maii dextras petit autumpnus sinistras
In sene uel iuuene prodest incisio uene.
Omni mense uene, quociens sunt sanguine plene.

Dies apti ad minuendum sunt dies sancti Valentini in Februario, et dies sancti Lamberti in Septembri.

Lex De Urinis[27]

Vrina ruffa salutem et bonam disposicionem corporis humani, urina subruffa sanitatem bonam ostendit, sed non ita perfecte sicut omnino ruffa. Vrina citrina quando est cum substancia mediocri et quando circulus est eiusdem coloris est laudabilis et eciam subcitrina, licet non ita perfecte sicut citrina. Vrina rubea sicut rosa signat febrem effimeram. Et si continue mingatur signat febrem continuam. Vrina rubea sicut sanguis in uitro signat febrem ex nimio sanguine et tunc statim debet fieri minucio, ubi luna fuerit in medio signi geminorum. Vrina uiridis quando mingitur post rubeam signat adustionem, et est mortalis. Vrina rubea a claritate omnino remota declinacionem morbi signat. Vrina rubea permixta aliquantulum in grauedine uicina epatis calefaccionem signat. Vrina pallida signat defectionem stomachi et impedimentum secunde digestionis. Vrina alba sicut aqua fontis in sanis signat cruditatem humorum, et in acutis febribus est mortalis. Vrina lactea est cum spissa substantia, et si accidat in mulieribus non ita periculosum sicut in uiris propter indisposiciones matricis; tamen in acutis febribus est mortalis. Item urina lactea superius et inferius obumbrata circa mediam regionem clara ydropisim signat. Item urina in ydropico ruffa uel subruffa mortem signat. Vrina karopos signat multi-

[26] Some of these lines can be paralleled with *Flos medicinae*, 2680 seq., 2716 seq., 2762, and are evidently taken from some amplified version of the same poem.

[27] This tract is also found in the following MSS.: Cambridge, Trinity Coll. MS. 500, fol. 1-4; Gonville and Caius MS. 413, fol. 32-34V; B.M. Royal 17 C XXIV; fol. iv; Rome, Angelica MS. 1456 (V. I. II) fol. 120v-121v. It is obviously an abridgement of some larger treatise, or a collation of several.

tudinem humorum corruptorum sicut accidit in fleumatico, ydropico, potagrico, et sic de aliis. Vrina nigra potest esse calore naturali extincto et tunc est mortalis. Vel potest esse propter expu[l]ssionem materie uenenose que expellitur per uias urinales et signat salutem. Vnde quartana semper est mortalis et mala. Vrina lucida sicut cornu ostendit et disposiciones et splenis disposicionem quartane. Vrina crocea cum spissa substancia fetida et spumosa signat ictericiam. Vrina ruffa, uel subruffa inferius habens resoluciones retundas et albas superius, aliquantulum pinguis febrem ethicam signat. Vrina in fundo uasis usque ad medietatem clara, postea uero spissa et tenuis, grauedinem pectoris signat. Vrina spumosa clara et quasi subrubea dolorem dextro latere maiorem quam sinistro ostendit. Vbi urina alta uel spumosa sit, signat maiorem dolorem in sinistro latere, frigidius enim est sinistrum latus quam dextrum. Vrina tenuis et pallida et clara acetosum fleuma ostendit. Si circulus urine nullo inquinescente tremulus apparuerit, decursum fluematis et aliorum humorum a capite per collum et per posteriora ad inferiora signat. Vrina spissa et lactea et rubea gutta in superioribus partibus corporis uel superioribus membris signat. Vrina inferius pallida in uiris dolorem renum signat. In mulieribus uero uicium matricis. Vrina in qua frustula apparent, si pauca sit et turbosa, uene rupturam circa renes et uesicam signat. Vrina in qua sanies apparet in fundo uasis contigua, renum et uesice putredinem uel apostema signat. Et si in tota urina sanies appareat, tocius corporis putredinem signat. Vrina in qua frusta apparent per uasa lata, uesice excoriacionem signat. Vrina athomosa per multum sepius lapidem in renibus signat. Vrina alba sine febre et in uiris et in mulieribus aliquando dolorem renum, aliquando impregnationem mulierum signat. Vrina pregnantium, si per unum mensem uel duos uel tres habuerit, debet esse multum clara, et albam ypostasim debet habere in fundo. Si uero quatuor habuerit menses, urina debet esse serena et ypostasis alba et grossa in fundo. Solet ymago in uase urinali tanquam in speculo apparere. Si urina illa sit mulieris, concepcionem signat. Et si ymago iudicantis appareat [in] urina patientis febres interpollatas uel epateticam egritudinem prolixitatem morbi signat. Vrina spumosa uentositatem stomachi in mulieribus, uel ardorem ab umbilico usque ad guttur et sitim signat. Vrina uirginis quasi subcitrina debet esse, unde urina liuida et nimis serena uirginem declinet constantem. Vrina uero turbida in qua semen apparuit in fundo, mulierem retentam cum uiro signat. Vrina uero mulieris densa eam esse corruptam tunc declarat predicta. Vrina saltem turbida in qua semen apparuerit in fundo uasis; si uero urina talis in uiro eum retentum cum muliere corsse autem declarat. Mulieres menstruate faciunt urinam sanguineam: si iste sanguis sit coagulatus in muliere, apparebit pregnans donec dissoluatur: dissolucio patet manticodia. Vrina multum nigra mulieris superueniet; si mota aliquantulum ruborem habuerit, solucionem menstruorum signat. Omnis urina est colamentum sanguinis, et est duarum rerum proprie significatiua, aut enim signat passionem epatis et uenarum, aut uesice et renum: aliarum rerum improprie significatiua Set in

urina consideranda [sunt] diuersa, scilicet sui colores, regiones et contenta. Aliud est substantie, aliud causa coloris, aliud causa sediminis. Cum enim in humano corpore quatuor qualitates, scilicet caliditas, frigiditas, siccitas et humiditas, sunt cause substantie et coloris. Caliditas est causa coloris rubei, frigiditas est coloris albi, siccitas est causa tenuis substantie, humiditas est causa spisse substantie. Vrina in partes diuititur: superior pars est circulus, secunda est corpus aeris, tercia est perforacio, quarta est fundus. Per circulum egritudo capitis et cerebri, per corpus aeris egritudo spiritualium membrorum et stomachi accidentia iudicamus. Vrina habens tres regiones, scilicet infimam, mediam et suppremam. Infima incipit a fundo urinalis et durat per spacium duorum digitorum. Media regio incipit ubi terminatur infima, et durat usque ad circulum, qui circulus est in supprema regione, et quando in ista supprema regione est spuma, signat uentositatem ebullientem uel inflacionem seu aliud uicium pulmonis. Circulus uero grossus signat nimiam in capite dolorem. In regione media quedam nebula alba est in sanis malum signum, sed in febricitantibus materie morbi. In infima regione sunt aliquando lapilli arenosi, et tunc denotat quod paciens est calculosus, et alii sedimen est nigrum, et tunc ubi fuerit per talem urinam expulsio materie uenenose signum est mortis: et cetera.

Tables of Eclipses

Here follow the figures of the eclipses: over each figure is placed the time at which the eclipse begins; if the hours and minutes put there are less than 12, it will be on the same day or before midnight, so many hours and minutes after midday.

But if the hours and minutes are more than 12, the eclipse of the moon will start that night (or if it be the eclipse of the sun, on the following morning) as many hours and minutes after midnight as there are above the number 12. Round the figure in the first part is shown how much of the diameter of the sun or moon will suffer eclipse.

Their diameter is divided equally into 12 parts, each of which is called a point, a digit or a 12th part: each point is divided into 60 parts, each one of which is called a minute: the 60th part of a minute is called a second.

If the points are less than 12, the eclipse will be partial and light will remain in some part of the [heavenly] body. If they are precisely 12, the eclipse will be total, but the shadow will not be prolonged.

But if the number of points exceeds 12, the whole body will be eclipsed and the shadow will remain for some time.

In the second part of the figure is recorded the time at which the moon will fall into its own or the earth's shadow or exceed its own or the earth's shadow. This time with the time of the half rest (marked in the third part of the figure) if there is any rest, added to the time of the beginning of the eclipse will give the time of the middle of the eclipse: and if you add it again to this, it will give the end of the eclipse.

The duration of the eclipse is put in the last part. The dominical letter of the same year is written under the figure at the left; the golden number at the right. Thus are shown the eclipses with all their circumstances and times, whether they have five times or only three.

But whether the whole eclipse will be seen, or only a part of it, can be found by comparing the times of the eclipse with the hours of the clock which are marked on the calendar for the days and nights in which the eclipse occurs. All of which can be remembered by this verse:

Puncta, cadente mora, duratio, tempus et hora.

TABLES OF PLANETS

This table of the planets is to be used by finding the day at the top and the hours at the left: where they coincide, the planet will be found which is in control at that hour. For each planet has particular influence above all others on the day or hour which is named after it.

A good deed therefore should be begun at any moment of time, but a bad one should be avoided when Saturn or Mars is in the ascendant.

The table of the moon is useful for bloodletting, but as art imitates nature, each thing should be done in its own time. An unstable sign is said to designate a quick change; a fixed one, stability, but a common sign, repetition and solution.

It is useful therefore to have an eye to the sign through which the moon is passing. The moveable signs are Aries, Cancer, Libra, and Capricorn, with which the four seasons of the year begin, namely, Spring, Summer, Autumn, and Winter, each one of which follows its own and a common sign.

To find the sign and degree of the moon quickly, begin at the top of the table with the sign and degree in which they join or with the degree nearest to it which has the lowest number and with the age of the moon: where these meet the degree itself is found: what corresponds to that sign is shown by the green lines leading transversally to and enclosing it.

THE IMAGE OF THE SIGNS

ARIES.	Avoid incisions in the head of the face and cut no vein in the head.
TAURUS.	Avoid incisions in the neck and throat and cut no vein in these places.
GEMINI.	Avoid incisions in the shoulders and arms or hands and open no vein here.
CANCER.	Avoid incisions in the breast and sides, lesions in the stomach and lungs, and cut no vein or artery that goes to the spleen.
LEO.	Avoid incisions of the nerves, lesions of the side and bones, and do not cut the back either by opening or bleeding.

VIRGO.	Avoid opening a wound in the belly and in hidden internal places.
LIBRA.	Avoid opening wounds in the umbilicus and inner parts of the belly and do not open a vein in the back or place a cup there.
SCORPIO.	Avoid cutting the testicles, anus, and vesica, and do not cut the verenda in man or woman.
SAGITTARIUS.	Avoid incisions in the thighs and fingers and do not cut blemishes or growths.
CAPRICORN.	Avoid cutting the knees or the veins and nerves in these places.
AQUARIUS.	Avoid cutting the legs and anywhere else as far as the heels.
PISCES.	Avoid cutting the feet.

On Blood-Letting

Blood-letting is done by juxtaposition or by opposition. If an ailment is chronic, blood-letting is done by juxtaposition, if of recent origin, by opposition. It is said to be done by juxtaposition when blood is drawn from the part in which the sickness lies. It is done through opposition when the blood is drawn from the opposite part.

One should consider if the matter is slimy, as in the tonsils, for then blood-letting should be done by juxtaposition. Similarly, if a man has been bitten by a poisonous animal, he should be let blood by juxtaposition. And because young men have abundant hot humours they should be let blood before tierce; when plenty of choler, between tierce and none. But as old men have more cold humours, particularly if they are melancholic, they should be let blood after none, which is the time of melancholy.

In phlebotomy four things are to be kept in mind: time, habit, age, and strength. During very hot weather phlebotomy should not be undertaken because humours are engendered and the good flow out with the bad. Nor should phlebotomy be done in very cold weather, because the humours are compacted in the body and difficult to draw out, and the good come out quicker than the bad. Phlebotomy should not be done at the new moon because the body is empty of humours at that time and by blood-letting they would completely drained out. Habit is said to be considered if an old man has been used to blood-letting: he should not be let blood because of his habit and his weakness. Age must be taken into consideration, since no one should be let blood before the age of twelve nor should a decrepit old man: yet some who are vigorous may be let blood. Above all, strength should be the criterion, for the strong should be let blood, but the weak on no account.

A man suffering from congestion, that is from too much blood, or from fever that is from unhealthy blood should be let blood immediately

the moon passes through the middle of the sign of Gemini. A man with fever caused by heat should be let blood from the cephalic vein: one suffering with fever caused by fasting and cold should avoid blood-letting. A man in a frenzy should be let blood from a vein in the head. One suffering from fever caused by weakness should be let blood with pork fat in his nostrils. This is the fever that lasts one day. A lethargic person should be let blood from the vein between the medical* and ring finger. A quinsy patient should be let blood from the cephalic vein in both arms. A patient with fever caused by a swelling should be let blood from the vein in the ring finger. A patient with pleurisy should be let blood from the cardiac vein by juxtaposition. A patient with intermittent fever should be let blood from the vein of the middle finger. A patient with one-day fever caused by phlegm should be let blood from the basilica, that is the vein of the liver. A patient suffering from false phlegm with itching should be scarified in the legs. A patient with one-day fever should be let blood from the basilica. A patient with tertian fever should be let blood from the hepatic vein in the right arm during summer, but in the winter from the left arm. A patient with habitual fever should be let blood from the median vein, that is, from the vein of the liver. A patient with dropsy should be let blood from the basilica. A patient with jaundice should be let blood from the hepatic vein in the right arm during summer, from the left during winter. A patient suffering from melancholy, frenzy, or mania should be let blood from a vein in the middle of the forehead. A patient with an inflamed liver should be let blood from the basilica of the right arm in summer, the left arm in winter. A patient with trouble of the spleen should be let blood from the salvatella, that is the vein between the medical and auricular in the left hand. A patient with trouble in the intestines, matrix, or vesica should be let blood from the sophena, that is the inner vein on both feet. A patient suffering from wind should be let blood from the vein that goes to the big toe. A patient suffering in the lower members should be let blood from the sophena in both feet and should be scarified in the legs. Gouty patients should be let blood from the basilica and afterwards from the sophena. A patient suffering from siriasis should be let blood from the outer sophena of the part where it hurts.

Note that when blood-letting is carried out from the veins in the folds of the arms, the moon should not be in Gemini: the same applies when cupping is done on the shoulders.

If the blood flows black, draw it off until it becomes red. If it is thick, until it thins out: if watery, until it becomes thick. If the blood cannot flow because the mouth of the vessel is closed, open the wound with a finger and the blood will come out with a rush.

* The finger next to the little finger; cf. Trevisa (R. Higden, *Polychronicon*, II, 313): "The fourthe finger that is y-cleped the leche by cause of the more hiftynge and fairnesse, for in that finger is a veyne that streetcheth to the herte."

The Salerne Schoole doth by these lines impart
All health to Englands King, and doth advise
From care his head to keepe, from wrath his heart,
Drink not much wine, sup light, and soone arise,
When meate is gone, long sitting breedeth smart:
And after-noone still waking keepe your eyes.
When moved you find your selfe to natures needs,
Forbeare them not, for that much danger breeds
In Spring your dinner must not much exceed,
In Summers heate but little meate shall neede:
In Autumn ware you eate not too much fruite:
With Winters cold full meates do fittest suite.

Flebotomy clears the mind, strengthens the memory, cleanses the guts, dries up the brain, warms the marrow, sharpens the hearing, curbs tears, encourages discrimination, helps the stomach, develops the senses, promotes digestion, produces a musical voice, dispels sleepiness, drives away anxiety, feeds the blood, rids it of poisonous matter, and gives long life. It eliminates rheumatic ailments whilst getting rid of pestilent diseases it cures pains, fevers and various sicknesses and makes urine clear and clean.

If anyone is let blood wrongly, he should put near or over the place hot leaves of hyosciamus moistened in oil.

A plaster to put over a swelling in the arms which has been caused by inefficient blood-letting: You should plaster the arm with wheat flour mixed with honey and milk for three days, and if it is not healed by then, you should raise the arm and then massage it with hot oil and warm hands, gently drawing the finger nails over the flesh from the hands as far as the shoulders.

A Cure For Cut Veins

Rub a leaf of rue boiled in laurel oil on the arm or the place where the wound is: or boil a bean in wine until it dissolves, add as much grease as is necessary and then bind it hot on the arm in a cloth. If the cephalic vein swells, it should be treated with water and oil, warm in summer, cold in winter, putting diaguilon on it. If the median vein swells, plaster it with a leaf of beet in a cloth which has been steeped in oil of roses.

If you let blood on the 11th April or 17th March
You will not suffer blindness.
If you submit to blood-letting on the fourth or fifth of May
You will never be taken by fever.
In March and May blood should be let from the right
In Autumn from the left.
Cutting the veins is good both for young and old,
In any month when the veins are full of blood.

The days best for blood-letting are the feastday of St. Valentine in February and the feastday of St. Lambert in September.

RULES ABOUT URINE

Urine that is ruddy betokens health and the good estate of the body: urine that is slightly ruddy shows good health, but not as perfect as that of ruddy urine. A yellow colour with middling substance and a circle of the same colour is promising, as is also slightly yellow, but not as perfect as yellow Red urine like rose signifies ephemeral fever: and if the patient frequently makes water, it signifies continuous fever. Urine red like blood in a glass vessel is a sign of fever caused by too much blood: blood should be let immediately when the moon is passing through the signs of Gemini. Green urine coming after red is a sign of inflamation, a mortal sickness. Red urine which is far from clear shows that the disease is nearing its end. Red urine mixed with mucous shown heating of the liver. Pale urine shows a weakness of the stomach and a delayed second digestion. When urine is like well-water it shows crude humours in a healthy man, but in acute fevers it is a sign of death. A milky urine of rather thick substance is not as dangerous in women as it is in men and arises from an unhealthy matrix: but in acute fevers it is a sign of death. Urine which is milky on the surface, dark at the bottom and clear in the middle is a sign of dropsy. But ruddy urine in a dropsical patient is a sign of death. Karopos urine (the colour of camel skin) is a sign of many corrupt humors, as happens in phlegmatic, dropsical, gouty and other people. When the natural heat of the body dies out, the urine may be black, and this is a sign of death. But it may show that poisonous matter is being expelled through the urinal canal, and then it is a sign of health. Hence quartan fever is always bad and mortal. Clear urine shows the state of the spleen in quartan fever. Saffron-coloured urine with thick, smelly, and frothy substance is a sign of jaundice. Ruddy urine, less ruddy at the bottom and showing round, white reflections above, and somewhat greasy is a sign of fever. Urine which is clear in the bottom half of the vessel, but dense and thin at the top is a sign of congestion in the chest. Frothy, clear, and slightly red urine shows that there is greater pain on the right than on the left. Where the urine is frothy high up, it shows there is more pain in the left, for the left side is colder than the right. Thin and pale urine which is clear shows acidity and phlegm. If the surface of the urine trembles without anyone shaking it, it is a sign of a flow of phlegm and other humours from the head through the neck to the lower members. Urine that is thick, reddish, and milky shows there is gout in the upper parts of the body. Urine that is pale towards the bottom shows a man to have pain in the intestines. Urine which has particles in it, if it is small in quantity and turbid, is a sign of a broken vein near the intestines or the vesica. Urine which has slime near the bottom of the vessel shows there is rottenness in the guts and vesica or an abscess. And if slime appears in the whole urine it is a sign that the whole body is rotten. Urine in which particles appear throughout the flask shows excoriation of the vesica. Urine with motes floating in it is most often a sign of stone. White urine without

fever is a sign both in men and women of intestinal pain, but sometimes it shows that women are pregnant. If a woman has been pregnant two or three months, her urine should be clear and have a white substance at the bottom. But if she is four months pregnant, her urine should be clear with a whitish and thickish substance at the bottom. In the urinal flask one's reflection should be like that in a mirror. If it be a woman's urine, it shows she has conceived. If the image of the uroscopist appears in the urine of the patient, it is a sign of intermittent fever or shows an oncoming sickness of the liver. Frothy urine indicates wind in a woman or a burning pain from the navel to the throat and thirst. A virgin's urine should be pale yellow, hence if it be bluish or very blue it indicates a constant virgin. But if the urine is turbid and seed appears at the bottom, it shows the woman has been with a man. If it is dense, it shows she has been corrupted. Turbid urine in which semen appears in the bottom of the flask also indicates that a man has been with a woman. Women have blood stained urine during their menses, and if such blood congeals in the woman she will appear to be pregnant until it dissolves.

If a woman's urine is dark, but on being moved shows some redness, it indicates that menstruation has ended. All urine is a filter of the blood and properly indicates two things, either an affection of the liver and veins or of the intestines and the vesica: of other things it is only indirectly indicative. In urine different points are to be considered, namely colour, place, and content. The reasons for its texture, its colour, and its sediment are different. For since there are four qualities in the human body, namely, heat, cold, dryness, and moistness, these are the causes of texture and colour. Heat is the cause of red colour, coldness of white; dryness is the cause of thin texture, moistness of thick. Urine is divided into parts: the top part is called the circle (or surface), the second is the body of air, the third is perforation, the fourth is the bottom. From the circle we can diagnose ailments of the head and brain, from the body of air the ailments of the spiritual members and the stomach. Urine has three positions, bottom, middle, and top. The bottom begins at the lowest part of the urinal flask and extends to the (breadth) of two fingers: the middle position begins where the lowest leaves off and extends to the circle which lies at the top: and when there is froth at the top, it indicates wind or inflation or some other ailment of the lungs. If the circle is thick, it indicates excessive pain in the head. A kind of white film in the middle position shows some weakness in a healthy person, but in feverish patients is the matter causing the illness. In the lowest position there are sometimes small sandy particles and then it means that the patient is suffering from stone: if the sediment is black, this is poisonous matter expelled by the urine and is a sign of death. Et cetera.

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Medical Almanacs of the American Colonial Period*

FRANCISCO GUERRA**

"The fault, dear Brutus, is not in our stars,
But in ourselves . . ."

In all cultures one of the constant elements of medical doctrine has been the belief that man was born under a certain star, propitious or unpropitious, which necessarily swayed his destiny, and an extension of this concept was the belief that the various portions of his anatomy were governed by the influence of the sun, the phases of the moon, the aspects of the planets, and the position of the constellations.

When mediaeval humoral pathology, based on the Greek tradition, divided therapeutic procedure into two basic methods, the purification of perverted humours by bleeding and their evacuation by purging, both measures came under astral dominion. Determination of the lucky or unlucky days had to be calculated in accordance with some Pythagorean number-mysticism, and the astronomical computation had to be developed from Ptolomeic principles. However, these computations could be greatly simplified by using astrolabes and by making out astronomical tables, not only as applied to medicine, but to other sciences as well. The first of such tables, the famous Alphonsine tables, were calculated during the 13th century in Spain under the direction of King Alphonso the Wise. The movements of the stars were recorded in these tables, which also supplied indications of the position and aspect of certain celestial phenomena that might exert an influence on terrestrial beings.

Astrological doctrines carried great weight in the era which saw the discovery of printing, and, as Osler pointed out, the first known piece of medical printing is the *Mainz Kalender* for the year 1457, printed at Mainz and set in the same type as that used for the 36-line Bible. This kind of calendar for purgation and bloodletting, known as *Aderlass-Kalender*, was also printed in other

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German cities, such as Augsburg, Nürnberg, Ulm, Strassburg, and Leipzig. These calendars, together with plague-warnings or *Pestblätter*, were the most popular medical literature during the incunabula period. Osler mentions 46 medical calendars printed before 1480[9]; Haebler and Heitz[7] have reproduced and studied a hundred such calendars up to the year 1500; and Sudhoff has described 48 interesting *Aderlass-Kalender*.[11] Typographically, they consist of a single sheet, or broadside, with some astronomical figures and a cut of a man, showing the influence of the stars and the signs of the Zodiac on each part of the body, and the parts of the anatomy most suitable for bleeding. As we shall see, this cut, some three or four hundred years later, became the most characteristic illustration of the Colonial American almanacs.

The medical almanacs were prepared by astronomers, by mathematicians, and in some cases by the official city physicians. The best known imprints of the 15th century were the work of George Peurbach (1423-1461) and Johannes Muller (1436-1476), better known as *Regiomontanus*.

Medical astrology among the aboriginal American Indians also exerted considerable influence. It should be borne in mind that Mexicans were named after the day they were born, and their calendars were also marked with lucky and unlucky days, as were those produced in Europe. This complex system of forecasting called for extremely involved computations, examples of which may be studied in the pre-Columbian codices.

Soon after the conquest of America, when printing began in Mexico City in 1539, broadside calendars appeared in Spanish America; very soon, however, the almanacs began to be presented in the booklet form which has been preserved until the present day. Medical astrology, the main feature of the almanacs, was the subject of many bulky tomes published both in Mexico and in Perú in the early years of the 17th century. The book by Henrico Martinez, *Reportorio de los Tiempos, y Historia Natural desta Nueva España* (Mexico, 1606), offers a careful study both of astronomical tables and of astrological signs and includes, moreover, a simplified paper *horarium* with which to cast horoscopes. The book by Ihoan de Barrios, *Verdadera Medicina, Cirurgia y Astrología* (Mexico, 1607), is based on somewhat sounder doctrine. In Perú, although at a later date, two interesting imprints made their appearance, one by Iuan Gerónimo Nauarro, *Sangrar y Purgar en días de conjunción* (Lima, 1645), and the other by Ioan de Figueroa, *Opúsculo*

de Astrología en Medicina, y de los términos y partes de la Astronomía necesarias para el uso de ella (Lima, 1660). Other no less important publications appeared in Mexico, for example, those by Father Kino in 1681, by the physician Escobar in 1681, Siguenza y Góngora in 1690, Dr. Gomez Solano in 1702, in addition to some almanacs which were published during the 18th century, giving the phases of the moon and prognostications of suitable days for bleeding and purging; these have been recently reproduced (Guerra, 1955).[5] It is, however, in the Peruvian almanacs of the Colonial period that the most interesting medical information is encountered. Schwab[10] points out that in the Peruvian almanacs, as in the Mexican ones, the author, in most cases a physician, provided a medical prognosis for the year, naming the diseases and epidemics which were to be expected, the phases of the moon, suitable dates for bleeding and purging according to the temperament of the patient, and in some years special medical essays on such subjects as obstetrics, epidemics, medical botany, and even on the circulation of the blood.

With regard to the North American almanacs, at this point it seems apropos to recall the statement made by Brigham when reviewing his 50 years of collecting Americana. He opens his memoirs by treating of the almanacs, asserting that: "The value of the almanac for historical study cannot be over-emphasized. . . ."[2] In the present territory of the United States the bibliographical study of the American almanacs has not been entirely neglected. Evans made a careful chronological record of all the almanacs printed from 1639 to 1820 which had been found; the same is true of Sabin (1868-1936). The Library of Congress published (1907) a checklist of almanacs to 1800, but this was soon superseded by the publication, under the auspices of the American Antiquarian Society, of *Check-lists of Almanacs* to 1850. The Massachusetts almanacs were recorded by Nichols, those of Connecticut by Bates, of Rhode Island by Chapin, of Maine and New Hampshire by Nicholas, of New York by Wall, and those of New Jersey by Heartman. In another work Guerra makes detailed studies of more than five hundred almanacs containing medical material, printed in the present territory of the United States up to 1783.

From the bibliographer's point of view, some American almanacs have great value. Many are known to have been printed though no copies have survived, partly by reason of their continual use for reference in the household, and also because of their small size.

In many cases the almanacs are bibliographical jewels; to cite one example, Brinley's copy of the New York imprint of an *Almanack for 1697 by John Clapp*, an author who was neither physician nor mathematician but who kept "a house of entertainment in the Bowry," was sold for $3,500 in 1929, even though it lacked the title page. Of course, in other cases quite a few copies have been located. It should be borne in mind that the number printed (usually in October of the year previous to that for which the almanac was calculated) was anywhere from five to ten thousand copies, and sometimes a second or even a third printing was necessary in order to cover the demand. In other instances the same almanac, with a few minor changes, was printed in two, three or more cities at the same time under the same title, although the imprint varied.

The almanacs printed in the thirteen American Colonies were issued as small duodecimo booklets. The earliest example of a medical almanac in broadside form, showing the German influence, is that by Daniel Leeds (1652-1720) printed in Philadelphia in 1687, barely seven years after the foundation of the city; the main typographical feature of this broadside is the use of the German zodiacal signs. However, the Cambridge and Boston imprints preceded those of Philadelphia. In the *Almanack by John Foster* (1648-1681) printed in Boston for the year 1678, there appears for the first time in North America a cut depicting the influence of the zodiac signs upon the various parts of the human body; this cut was subsequently to be included almost invariably in the American almanacs of the Colonial period, and even today it sometimes figures in contemporary calendars. It is important to note that the astronomical-zodiac cut was inserted in over 90 per cent of more than 1,600 almanacs published.

On the other hand, the tenets of astrological medicine did not go entirely unchallenged. Before long, a Boston physician named Christian Lodowick published *The New-England Almanack for 1695* and inserted the comment that a ". . . Pagan Tulley ('s) conceipts of the Dominion of the moon in Man's body, as it passeth under the 12 signs; and by the Physical Observations in his late Almanack, about letting blood, Purging &c. when the Moon is in such or such a Sign, are things disclaimed by the greatest part of Physicians." John Tulley answered the criticisms of "my friend Lodowick" in *The Tulley's Almanack for 1696*, but after that year he no longer allotted space to the prognosis for disease or

the section on astrological medicine. Some years later William Douglass (1691-1752), one of the most celebrated medical authors in America during the first half of the 18th century, published the almanac *Mercurius Nov-Anglicanus* for 1743, using the pseudonym of William Nadir, L.X.Q.; there is no reference in this almanac to astrological medicine, nor are there any of the medical counsels so commonly inserted in most of the contemporary almanacs. Despite these early attempts to debunk or ignore astrological medicine, and notwithstanding another special essay by Jacob Taylor in the almanac for 1743 deriding the concept of astrological medicine, the cut of the zodiacal influences on human anatomy, together with the section on astrological medicine, continued to appear in practically all the almanacs published during the American Colonial period. Even so, in spite of these concepts of astrological medicine, the American almanacs remain an exceedingly valuable source of information in several fields of medicine. A few selections will serve to illustrate this point.

BIBLIOGRAPHY

In some instances the almanacs provide references to publications of which little is known or which are of uncertain date. In the *Almanack for 1695* by John Tulley (Boston, printed by Benjamin Harris), another book from the same printer is advertised: *John Oliver's Present to be given to Teeming Women*, which was printed in 1694 and is the first American obstetrical imprint, of which only two imperfect copies have survived. In the *Almanack for 1727* by Nathaniel Whittemore (1670-1754), printed in Boston for Nicholas Boone, there is an advertisement of books sold by this publisher, and among the titles appears *Culpeper's Dispensatory* (1720) which, on account of the hard binding, has been considered to be the first medical book of the Thirteen Colonies. Titan Leeds, in the almanacs for 1742, 1743, and 1745, advertised the publication of the *Young Man's companion . . . with a collection of choice and safe remedies very useful in Families*, a very popular vade mecum which ran through many editions during the Colonial period. Another publication of a similar nature is *The compleat housewife . . . A collection of near two hundred family receipts, &c. to which is added, Every Man his own Doctor: or the Poor Planter's Physician*, which was advertised in *The Virginia Almanack for 1753*. *Father Abraham's Almanac for 1760* contains a catalogue of the medical titles to which the physician of those days

most commonly referred, including works by Neal, Quincy, Munroe, Chamberlayne, Holland, Pringle, Nelson, Brooks, Bellini, Chapman, and others, all of these books being imported from England. *The South-Carolina Almanack for 1764* and that for 1767 carried an advertisement of books for sale by the printer Robert Wells, including Culpeper's *Midwifery* and *English Physician*, the *Young Man's Best Companion*, and the *New English Dispensatory*. *The Universal American Almanack for 1765* announced the publication of *Primitive Physick* by John Wesley, and some recipes taken from this book were inserted in the almanacs for 1766 and 1767; these recipes also appeared in *Poor Will's Almanack for 1771*. In *Tobler's South-Carolina & Georgia Almanack for 1768*, Robert Wells advertised among the books printed and sold at his shop in Charleston, *Essays on Fevers, wherein a new and successful method, confirmed by many years experience, is laid down for removing them speedily; written with all the plainness the subject allows. By Lionell [sic] Chalmers, M.D. Useful in all families.* No copies of this imprint are known to have survived.

Dentistry

In this field it should be pointed out that although Weinberger, who so carefully reviewed Colonial literature in search of material both manuscript and printed, offers a good record of dental advertisements which appeared in newspapers, he has not published the dental material contained in almanacs.[12] Here references to dental matters are related not only to the teeth, and more particularly the cure of toothache, but also to the cleaning and scaling of the teeth, dentifrices, plumbing of the teeth, scurvy in the gums, regulation and growth of the teeth, and to halitosis resulting from dental infection.

The first dental remedy to appear in an almanac is in *The New-England Almanack for 1695*, inserted by Dr. Christian Lodowick under the month of August, the recipe being "To prevent the toothach & Keep the teeth sound." In his *Almanack for 1738* (Boston), Nathaniel Whittemore offered the second recipe "To cure the Tooth Ach." The third was by Titan Leeds (d. 1737) in *The American Almanack for 1742* (Philadelphia), and this was followed by other contributions from Christoph Saur and Thomas More. In the Almanac for 1752 More not only referred again to the question of toothache, but also took up the dental problems caused by children's teeth. Recipes for the cure of toothache were

also contributed by John Tobler in *The South-Carolina Almanack for 1756* and 1767.

Andrew Aguecheek (in *The Universal American Almanack for 1760*) adopted a humorous vein, "If you are troubled with the Tooth Ach take the juice of Rue . . . but Dutch Jacob in Second Street (Philadelphia) has a more effectual remedy." *The Hutchins Almanack for 1765* gives "Dr. Radcliff's only true specific tincture for the Tooth-Ach, and all disorders of the teeth and gums." The cure for toothache from Mr. Van Aken, an apothecary from Sweden, was published in *Poor Roger's Almanack for 1767*. Other remedies are to be found in *Poor Richard's Almanack for 1767*.

Freeman's New York Almanack for 1768 contains "Rules for the preservation of the teeth and gums," in which reference is made to the enamel of the teeth and to measures to be taken for its protection. *Poor Will's Almanack for 1774* included a liquid remedy for decayed teeth, a receipt "to clean the teeth and gums, and make the flesh grow close to the root of the enamel," and another remedy for sore gums and loose teeth. These examples are but representative samples; many more could be cited.

EPIDEMICS

The first almanac with medical information, that of Samuel Danforth (1626-1674), printed in Cambridge, Massachusetts for the year 1647, carried a chronological table, recording in the months of September and October 1633, ". . . The first great mortality among the Indians by the Small Pox, whereof Chickatabut Sachem of Naponset & John and James Sagamore dyed." In the Almanac for 1648 the same author stated that in the month of April 1647, there was "An epidemical faint cough through the Company." A similar observation appeared in the almanac (Boston, 1679) by John Foster (1648-1681): "July 10, 1677. The vessel arrived at Nantasket which brought that contagious Distemper the Small Pox, which was soon taken by some of Charlestown [Mass.] going aboard, since which time many thousands have taken the infection, and more than seven hundred already cut off by it."

Another chronology of epidemics in New England appeared in the almanac by Samuel Clough (d. 1708?) for 1701. In the observations for the month of June that author states: "In the year 1678 was the terrible Small Pox time, it was all almost all over the country over, but especially in this and the two following months

in Boston, very many dyed of it." On the last leaf of this imprint is a reference, ". . . The Measels in Boston, multitudes had them 1687"; ". . . The Small Pox in Boston & many Dy'd 1690." Four years later, Clough repeated the same information in his almanac for 1705, adding ". . .1702. June 15. The Small-pox again brought into Boston." This chronology of early epidemics was reproduced in 1714 by a physician, Thomas Robie (1689-1729). These records of the dates, locations, and extent of the smallpox epidemics in North America are of the utmost importance because they clarify the question of independent ports of infection. Smallpox has been deemed to be the cause of extremely high mortality among the American Indians, and it was thought that the disease was established during the conquest of Mexico by Hernan Cortés in 1519-1521; the spread of smallpox began there from a Negro lad who arrived from Cuba with the troops of Pánfilo de Narvaez. However, the chronologies in the almanacs demonstrate that the disease in North America had several independent origins, some among Spanish and others among British settlers.

Another epidemic disease which caused many deaths among New England children was diphtheria. Some references to it are found in the *Virginia Almanack for 1752* by Theophilus Grew, printed in Williamsburg. More information was collected by Nathaniel Ames (2nd) in his popular almanac for 1754. A sound study of diphtheria was made by Philo Copernicus in *Rivington's Almanack for 1774* (New York), in which is reproduced the essay by Dr. Jacob Ogden, written in Jamaica, L. I. in 1769, and reprinted several times in other cities.

A classic account of an epidemic, Defoe's description of the ravages caused by the plague of London in 1665, occupied 19 pages in *The Pennsylvania Town and Country Man's Almanack for 1763*.

Hygiene

One of the more outstanding features of the Colonial almanac was the comparatively vast extent of its influence; the almanac found its way into the remotest homes and supplied a reading public which could not be reached by either medical or general literature, even by the newspapers, and the consequent influence of the almanac thus completely overshadowed that of any other publications of this period. It was common practice to insert in the almanacs not only the poems and moral essays to which Benjamin Franklin was so addicted, but also short studies of health measures.

Some of this medical advice was the fruit of common sense, but in most cases it was extracted from the works of medical authors such as Boerhaave, Cheyne, or Tissot, who were so popular in the latter half of the 18th century.

While carrying on a printing business in Newport, R. I., the Franklin family were the first to publish a medical essay of this nature; "Observations for Physick and Diet" appeared under the pseudonym of "Poor Robin" in *The Rhode-Island Almanack for 1728*. Benjamin Franklin (1706-1790) afforded the subject more detailed treatment in the *Poor Richard's Almanack for 1742*, in which was published, "Rules of Health and Long Life, and to preserve from malignant fevers and sickness, in General," and also "Rules to find out a fit Measure of meat and drink." However, the most extensive treatise was that on alcoholic beverages which appeared in the 1781 issue of *Poor Richard's Almanack*. Chinard has recently studied this aspect of Franklin's publications.[3]

In the Pennsylvania area the question of health was treated by Christoph Saur in the *Hoch-Deutsch Americanische Calender* for 1749 (German text), in which he presented an essay "Von Gesundheit und Kranckheit." Nathaniel Ames (2nd), in the almanac for 1752, referred to the works of Sydenham and Cheyne when writing of the effects of rum on the health, another very much discussed topic in Colonial times. Ames published in his *Almanack for 1754* (Boston and New Haven) an "Essay upon Regimen, on Air, Diet and Exercise," based on Dr. Cheyne's theories, and which was continued in 1755, 1757, 1758, and 1759. Also extracted from Cheyne's work was the essay on health published by John Tobler in *The Pennsylvania Almanack for 1755*, and the Rules for Health printed in *Low's Astronomical Diary for 1772*. In *The Universal American Almanack for 1760*, Andrew Aguecheek published "Rules for temperate living" by Luigi Cornaro. *The Bickerstaff's Boston Almanack for 1768* gave an "Account of the most usual causes of popular diseases" (4 pp.) taken from the work of Tissot. Another abstract, also from Tissot, takes up 16 pages in *The Virginia Almanack for 1768*, and yet another occupies two pages of *Ames's Astronomical Diary for 1772*. N. Daboll, in the *New England Almanack for 1777*, offered a long dissertation on the most usual causes of popular sickness. N. Strong, in *Stafford's Almanack for 1778*, presented "Rules for preserving health in eating and drinking." It should be noted that another of Tissot's works soon began to reach the American public through the almanacs, for in *An Astronomical*

Diary for 1779, Low published "Directions to Studious people for the preservation of their Health."

The noxious effects of alcoholic drinks were discoursed upon in several almanacs. An abstract of the theories of Drs. James and Cheyne in this field appeared in *Low's Astronomical Diary for 1768*, and another similar article, quoting from the works of Short, Allen, Hoffmann, Lind, and others, was published in *Tobler's Pennsylvania Almanack for 1770*.

Infectious Diseases

With regard to both mortality and morbidity, smallpox was without doubt the most virulent disease to attack European, Indian, and Negro alike during the Colonial period. The literature devoted to the topic, and printed in America, is not equalled either in quality or quantity. The almanacs naturally reflect the widespread interest in the problem of smallpox. In *The South Carolina Almanack for 1760* (Charleston), George Andrews devoted seven pages to the question of inoculation and the treatment of smallpox, citing opinions culled from the best reputed authors of those days, such as Sydenham, Swann, and Pitcairn. The same topic was taken up in the following year by Nathaniel Ames (2nd) in his *Almanack for 1761*, which appeared in several cities. There is a two-page description of the disease, symptoms, and cure by the use of mercury (much in vogue at that time), and some references are made to Dr. Cheyne's theory of fevers. However, for the present-day reader, perhaps the most interesting indication of the value of Ames's essay is his clear concept of the mechanism of contagion. He writes, "A person cannot be infected with the terrible distemper . . . without the . . . variolus pus of the diseased person be received in to the blood. . ." He recommends, furthermore, the measures suggested by Dr. Hales for disinfecting a house, as a method of preventing the spread of infection. A long "Narrative of the Small Pox" also appeared in the last of Ames's almanacs—that for 1775.

There were many other essays on smallpox, inoculation for it, and pre-medication techniques for inoculation. Among those of interest are the articles by Theophilus Wreg (i.e., Grew) in *The Virginia Almanack for 1761* and 1770 (Williamsburg), by Richard Saunders (an early pseudonym adopted by Franklin) in *Poor Richard's Almanack for 1761*, by Andrew Aguecheek in *The Universal American Almanack for 1762*, by John Nathan Hutchins

in the *Hutchin's Almanack for 1768,* by Anthony Sharp (David Rittenhouse) in *The Lancaster Almanack for 1773,* and by Nathaniel Ames (3rd) in the *Almanack for 1775,* in which is presented an account of the introduction of inoculation into England by the Turks.

A perusal of the pages of the Colonial almanacs reveals repeated studies of other common infectious diseases which plagued the Colonial American, together with a host of suggested cures for his afflictions, among them bacillary dysentery, better known in those days as the bloody flux, and phthisis or consumption. Measures for the treatment of the bloody flux, and particular mention of the old recipe devised by the celebrated Mr. Robert Boyle, were extracted from the *Edinburgh Medical Essays* and are to be found in *Poor Richard's Almanack for 1756.*

Remedies for rabies are frequently to be encountered in the almanacs. In *The Pennsylvania Almanack for 1758* John Tobler reprinted a recipe which had appeared in *The London Magazine* for January 1755, and the same recipe also figured in *Father Abraham's Almanack for 1783.* In *The Universal American Almanack for 1760,* Andrew Aguecheek published observations on mad dogs which had been written for the *Mémoires* of the Royal Academy in Paris.

Phthisis, or consumption, was extremely widespread in Colonial times, and repeated studies of the disease were made and innumerable therapeutic procedures put forward. In some instances sound medical literature was reviewed, as in *Ames's Almanack for 1752* where Cheyne's ideas on the subject are collected and presented. Another article on pulmonary consumption, based for the most part on Boerhaave's theories, was published by Joseph Perry in his *Astronomical Diary for 1772;* here also is to be found a comparative study of the use of cinchona and other drugs, this being continued in the almanac for 1773. Another study of tuberculosis was published by Samuel Stearns in the *North-American's Calendar for 1773.* Boerhaave's ideas on the treatment of the "hectic fever" reappeared in *Warren's New England Almanack for 1775.*

In the southern and temperate areas of the American Colonies the occurrence of contagious diseases which were frequent among the slaves in the tropical regions and the Caribbean attained considerable significance. It should be remembered that early diagnoses of syphilis, yaws, and so-called scurvy were not clearly defined. In *The South-Carolina Almanack for 1759* (Charleston),

John Tobler published "Mr. Howard's receipt for curing the Yaws, lame distemper, Scurvy, Rheumatism, &c., for the discovery of which, the General Assembly for this Province hath allowed him a gratuity of £3000." This resolve of the Assembly was made at a time when a Negro, one Caesar, had been granted his freedom and given a gratuity for the discovery of a cure, made of medicinal plants, for "rotten blood" and other such obscure disorders of which the symptoms seem to indicate syphilis. Howard's, Caesar's, and Sampson's recipes were also published in *Ball's Almanack for 1768.*

The treatment of whooping cough was a frequent item in the almanacs. In *The Essex Almanack for 1772,* Samuel Hall (1740-1807), calling himself "Philo Freeman," recommended the use of spikenard root. In his *Almanack* for the same year John Nathan Hutchins offered remedies for whooping cough, as did David Rittenhouse in the *Virginia Almanack for 1772.*

Materia Medica

Colonial almanacs frequently contain information on medical botany, the German-influenced almanacs tending to publish this type of material more frequently than others. An example is the series of *Hoch-Deutsch Americanische Calender,* published from 1739 to 1758 by Christoph Saur, Senior (1695-1758), who is believed to have studied medicine in Halle. After the death of Saur senior, his son, Christoph Saur, junior (1721-1784) continued the series, and also continued the studies of medical botany which had been established by his father; the particular source they used was the *Kräuterbuch* of Theodor Zwinger, Jr. (1658-1724). This topic has been the object of careful studies by Lick and Brendle[8] and by Brendle and Unger.[1]

The first references to medical botany which appear in the almanacs of Daniel Leeds (1652-1720) for the years 1694-1699, 1713, and 1715, still show traces of the influence of Babylonian medicine, using principles already current in the time of Arad-Nanai (3000 B.C.). These Leeds almanacs contain a section on "The most apt times to gather Herbs, when the Planets that Govern then are dignified." Titan Leeds (1663-1727) continued the Leeds tradition, and in his *American Almanack for 1729* (Philadelphia), two pages are allotted to "Dr. Tennent's infallible cure for Pleurisy," based on a decoction of Seneca rattlesnake root. This remedy was very popular in Colonial America, had been introduced into England,

and more than a century later was still widely used, even in South America. The best pharmacological account of this drug was presented by John Tobler in *The South-Carolina Almanack for 1759*, and 1760; the article was headed, "Some account of the Seneka-Rattle-Snake Root, with directions for curing the pleurisy with it. Published in The Virginia Gazette, by Dr. John Tennent when he first discovered the properties and uses of that certain and valuable Remedy." This study also appeared at Charleston in *Ball's Almanack for 1768*.

Other issues of *Titan Leeds's Almanack for 1729* and 1730, and almanacs by Felix Leeds for 1730, and by Thomas Godfrey for 1735 and 1736, continued the section on gathering medicinal herbs ". . . according to the opinion of Old Culpeper." Even Benjamin Franklin fell under the spell of botanical lore and published in *Poor Richard's Almanack for 1737* an essay on the Rattle-Snake Herb, with a cut of the plant, and this was reproduced in *Poor Richard's Almanack for 1740*. In *The American Almanack for 1741* (Philadelphia) John Jerman presented an essay by John Bertram (i.e., Bartram, 1701-1777) which is one of the earliest in American pharmacognosy dealing with the "True Indian physic," or ipecacuanha, as useful in the treatment of the prevalent bloody flux; the same drug is still in use for the same ailment. This study by Bartram was also reproduced in *Poor Richard's Almanack for 1741*.

Dr. Hill's patent medicines, prepared in England, were widely used in America; his studies of materia medica were also well known, and his work on the properties of sage was reproduced in *Bickerstaff's New England Almanack for 1776*. German botanical lore was taken up again by Miller in his *Philadelphischer Calender* for 1776, in which he published parts of Zwinger's herbal; this was following the exile of the Saur family of printers on account of their Loyalist sympathies.

There was much interest in the American Colonies in the publications on tar water by Bishop Berkeley, claiming that tar water was excellent for the prophylaxis and cure of many diseases. An "Abstract . . . adapted to diseases frequent in America" from George Berkeley's works was published by Leeds in *The American Almanack for 1746*, and this essay was reprinted by T. Fox in the *Wilmington Almanack for 1772*.

An essay, probably from the hand of Benjamin Franklin or his partner, J. Böhm, was published in German in the *Neu-einger-*

ichteter Americanischer Calender for 1750, with the title "Von einem kleinen Apothecar-Garten," and is a direct descendent of the herbals of Brunfels and Fuchs. This type of essay was also published by John Tobler in *The Pennsylvania Almanack for 1755*, continued in 1756, and in *The South-Carolina Almanack for 1758*.

An abstract on the medicinal properties of tobacco, taken from Boerhaave, was printed in the five editions of *Ames's Almanack for 1764*, and also appeared in *Der Americanischer Calender* for 1772, printed in Ephrata.

The fact that syphilis was widespread among the Colonial population is clearly established by the number of mercurial preparations which were advised. One of these, known as "the poor man's medicine," was published in *Poor Richard's Almanack for 1768*, and in several others.

Negro Medicine

The manifestation of racial distinctions in medical practice in Colonial times brought about a paradoxical situation which may lead to far-reaching historical reflections. In 1748, the General Assembly of Virginia enacted that any Negro or other slave preparing any medicine should suffer the death penalty. From 1749 to 1751 the Assembly of South Carolina passed similar acts, preventing Negroes or other slaves from administering any medicines, or from being employed by either physicians or apothecaries, and forbidding under pain of death, any Negro to pass on knowledge of any poisonous plant, or to administer any such plant. This topic has been studied by Cowen.[4]

It should be borne in mind that these restrictive laws had some reasonable basis since cases of poisoning of white masters and their families by Negro slaves were by no means infrequent, as witness the accounts of such murders in the newspapers of the Colonial period. Despite this, history repeated in America the story of the early Christian and slave physicians of Greece and Rome: a knowledge of drugs and medicines was a weapon sufficiently powerful to raise the status of the slave. In some cases, Negro slaves were granted their freedom in exchange for divulging the secret of the cures they had evolved; one Caesar was not only freed but also granted a sizeable gratuity by the Provincial Assembly as the price for the two remedies he had devised. *The Virginia Almanack for 1753*, by Theophilus Grew, was the first to offer "The

Negro Caesar's Cure for Poisons. Caesar's Cure for the Bite of a Rattle Snake." Public interest was evidently aroused, for it was found necessary to reprint both recipes in *The Virginia Almanack for 1754* and 1775. They also appeared in *The Pennsylvania Almanack for 1757*, together with a note to the effect that the recipes had been first published in *The South Carolina Gazette* in 1750. Tobler reprinted "Negro Caesar's cures for Poisons and Bite of the Rattle-Snake" many times in successive issues of *The South Carolina Almanack*, thus rendering the rôle of the Negro herbalists even more at odds with the preventive laws governing Negro medical practice. The transmission of established Negro herbal remedies was extended by the publication of "The cure for the bites of a Rattle Snake, as discovered by Sampson, a Negro." The recipes devised by Caesar, based on plantain and horehound, and that invented by Sampson, which made use of snake root and other vegetable substances, were given in detail in *Ball's Almanack for 1768* (Charleston), in *Tobler's South Carolina & Georgia Almanack for 1768* and for 1772, and were also reprinted in Thomas More's *Poor Tom Almanack for 1772* (Charleston), and in *Poor Will's Almanack for 1783*. These Negro remedies were by no means confined to Southern use, and in Connecticut, Negro Caesar's cure was inserted in extenso in *Warren's New-England Almanack for 1775*.

The title of the following remedy, which appeared in *The South Carolina & Georgia Almanack for 1783*, is worthy of note in that the writer observes, apparently with surprise, that the remedy has been seen to have the same pharmacological action on people of different races: "An easy, short and certain cure for the bite of Mad Animals, where by men, women and children, Indians, Portugeuze [*sic*], Blacks, Mulattoes, &c. more than 300 in number, have been treated with equal success, without being afflicted with the least symptom of madness."

PATENT MEDICINES

The first printed notice of a pharmaceutical preparation sold in the American Colonies appeared in the *Kalendarium Pennsilvaniense* by Samuel Atkins, printed in Philadelphia in 1685. Inserted in this is an "Advertisement of some experienced Medicines, sold by William Bradford in Philadelphia. Charles Marshall's Spiritus Mundus, being an excellent medicine against all sorts of Feavers and Agues, Surfeits, Gripes, Plurisies, &c. A present Rem-

edy for the Gravel and Stone, which seldom fails to give ease in half an hour. Elixir Salutis, or the soveraign reviving Cordial drink, of admirable use in the cure of most distempers. The true Spirits of Scurvey Grass, highly approved for their admirable cures in the Scurvey, Dropsie, and many other." Not much later, John Tulley published in his *Almanack for the Year of 1690* (Boston) another "Advertisement. That excellent Antidote against all manner of gripings, called Agua antitorminalis, which if timely taken, it not only cures the Griping of the Guts, and the Wind-Chollick; but preventeth that woful Distemper of the Dry Belly Ach; With Printed Directions for the use of it. Sold by Benjamin Harris at the London Coffee-House in Boston. Price three shillings the half pint Bottle." This advertisement subsequently appeared in the almanacs for 1692 and 1694.

The list of patent medicines sold by William Bradford in Philadelphia is somewhat longer, as may be seen in an advertisement which was inserted in the Daniel Leeds almanac for 1693: ". . . Lockyers Pill, Matthews Pill, Mathridate, Diascordium, Vinice Treakle, Manna, English Saffron, &c. . . ." In the first decade of the 18th century pharmaceutical advertising was transferred to the daily press, and the resultant fantastic growth of the pharmaceutical market was to produce in America the almost universal practice of self-medication. Such an enormous market was developed for all kinds of nostrum, both fearsome and innocuous, that the latter half of the 19th century has been dubbed "The Golden Age of Quackery." Countless other advertisements for patent medicines are to be found in the series of Colonial almanacs.

Veterinary Medicine

In no other Colonial literature is there to be found so much information on epizootics and diseases of domestic animals as in the almanacs. The earliest items, "Approved Remedies for Horses, Oxen, Sheep, &c. . . ." were published in the *Almanack for 1727* by Nathaniel Whittemore. John Jerman (1684-1769) included in his *Almanack for 1739* "A receipt for a Horse's cold," while other remedies appeared in the almanac for 1762. Titan Leeds presented a longer study in *The American Almanack for 1744*, called "A few useful and necessary receipts for the cure of Horses and other Cattle." In the *Hoch-Deutsch Americanische Calender* for 1746, Christoph Saur offered his first section of medicines for cattle and horses; he was to deal more extensively with this subject in

his subsequent almanacs. It is interesting to note the many occasions that Saur makes use of antimony in the prescriptions he recommended, this tendency being a clear indication of the Paracelsian roots of his medical education in Germany. A special article on antimony was inserted in his almanac for 1764 and again in 1767.

Other remedies for the ailments of horses and cattle appeared in innumerable almanacs throughout the entire Colonial period. *The American Country Almanack for 1764* by Roger More has an interesting item: "As we hear that the Distemper among the horned cattle, of which so many thousands have died in Europe, is got into America, the following Method of Cure is recommended to the Publick having met with surprising success in England. . . ." This is the earliest account of foot-and-mouth disease in America. *The Virginia Almanack for 1768* also devotes space to this disease. Diseases and parasites in sheep are treated of in *The Wilmington Almanack for 1766* by Thomas Fox.

In addition to some remedies for horses, in the *Poor Thomas Almanack for 1766* are to be found details of "An experiment proposed for distemper'd cattle, by way of transfusion or rather injecting a particular liquor into their blood, than which nothing can be done with greater ease or at a smaller expense."

A description of the "distemper prevailing among the horses" also appeared in *Copernicus' American Almanack for 1768*. This same almanac for 1774 contains a long section on hygiene and therapeutics among cattle. In the *Poor Thomas Almanack for 1768* there is a reference to an outbreak; "As a fatal disorder among the Horses has broke out of late and seems to increase, the following cure is at the Public's service, as many have been cured thereby in a short time." Stearns, in the *Universal Calender for 1783*, offers advice to farriers as to the proper disposal of dead animals in order to avoid contagion.

David Rittenhouse (1732-1796) inserted a cure for murrain and other contagious diseases in cattle in the *Universal Almanack for 1773*. Other remedies suggested by the same writer were included in several Colonial almanacs.

VARIA

There are many varied and intensely interesting miscellaneous topics, all related to the medical sciences, also to be encountered in the almanacs. For example, Nathaniel Ames (2nd) presented a cur-

ious essay on the microscope, in verse form. Descriptive essays on gout and on the stone and gravel, together with the invariable recommendations for safe and certain cures, made frequent appearances. In *The American Almanack for 1745* Titan Leeds published "A full discovery of the medicine given by me Joanna Stephens, for the cure of the Stone and Gravel"—this account takes up no less than 12 pages.

In *The Virginia Almanack for 1754*, Theophilus Grew inserted a recipe, together with a note, "In pursuance of a Resolve of the General Assembly, the following Method of curing Cancers, having been found efficacious by the Committee appointed to make trial of it, is published exactly from Mrs. Mary Johnson's Receipt." In those days, be it remarked, the term cancer included not only some clearly defined neoplasms of the breast, but was also applied to ulcerated sores of different origin. This receipt was subsequently reprinted in other almanacs.

Benjamin Franklin's pursuit of natural philosophy is demonstrated in a paper of considerable physiological interest, "Observations on the high Mountains of Perú, by Monsieur Bougher, of the French Academy," which was published in *Poor Richard's Almanack for 1755*, taking up 15 pages with a sound description of respiration and fatigue in anoxia. The method of obtaining fresh drinking water at sea was reviewed by Joshua Appleby, Chymist of Durham, in *The Universal American Almanack for 1762*. Stimulation of the central nervous system by tea is clearly described in an article, based on some studies by Dr. Hale, which appeared in *Ames's Almanack for 1762*. In *The South Carolina Almanack for 1763*, George Andrew published "A Receipt for curing Cancers; made publick in pursuance of a resolution of the General Assembly. . ." The remedy may have been worse than useless, but at least the Assembly had demonstrated its interest in the continuance and encouragement of medical research.

The best presentation on pediatrics appeared in *Poor Richard's Almanack for 1763*, in which space was allotted to "Dr. Lobb's Directions for the management of Children in Health; and with an account of the Distempers common to them." This article also appeared in *Hutchin's Almanack for 1778*. Another article on suckling children was presented in *Hutchin's Almanack for 1773*, and in Tobler's *South Carolina Almanack for 1774*. *The American Calender for 1767* allots space to "An account of the success of the bark of the willow in the cure of agues. In a letter to the right

honourable George, Earl of Macclesfield, President of the R.S. from the Rev. Mr. Edmund Stone, of Chipping-Norton, in Oxfordshire. From the Philosophical Transactions (1765)." This is an early use of salicylate as it occurs in natural form in plants. In *The Freeman's New York Almanack for 1767* is a recommendation of "artichoak" leaves in the morning as a remedy for jaundice. Systems of resuscitation after drowning were printed repeatedly in almanacs by Saur, Aguecheek, Rittenhouse, Tobler, George, and others.

The question of medical education was discussed in *Ames's Astronomical Diary of 1770* (with reference to the Royal College of Physicians in London), also the theories of Linacre and the training of students at the Pennsylvania Hospital. It was not until 1773, however, that the Rules of the Medical School in Philadelphia and the notices of the Pennsylvania Hospital were published in *Aitken's General American Register*. After that year the Registers issued by Aitken and Gaine carried descriptions of the hospitals, physicians, surgeons, and other personnel in Philadelphia and New York in addition to lists of the medical staff in both Continental and Expeditionary Armies, including the Hessian troops, and of the medical teaching staff at the New York College. In the *Pocket Almanack* for 1782 and 1783 Fleet gave the names of the fellows of the Massachusetts Medical Society.

The first description of a dwarf, with a cut of the woman, appeared in *Ames's Astronomical Diary for 1772*. The first case of gigantism in a boy is also to be found in an almanac. In the *Pennsylvania Town and Country Almanack for 1772*, John Tobler offered suggestions for the treatment of the falling sickness, or epilepsy; these include the administration of valerian in conjunction with other medicinal plants, and the writer also stresses the need to place a piece of metal between the patient's teeth during the convulsions, in order to avoid lesions in the tongue. A most unusual approach to the problem of euthanasia was printed in *Father Abraham's Almanack for 1772*, under the title, "Of Diseased Parents and their Children." Even tarantism found a place in the American almanacs, *George's Almanack for 1777* carrying an essay on "The Italian spider, called Tarantula" and the cure of tarantism by music.

The poisonous effects of copper salts from the use of copper cooking utensils was discussed in *Poor Richard's Almanack for 1780*. An article on suffocation by nitrous vapours, taken from the

Transactions of the Royal Academy of Sciences, [*C.R. Acad. Sci. (Paris)*], appeared in the *New Jersey Almanack for 1780*. A most unusual clinical case was reported in *Thomas's Almanack for 1781*: "An account of a very extraordinary case of a woman who had been seven years without any evacuation by stool or urine." This account, taken from a work by Dr. Gignoux, explained the woman's survival to be due to compensatory sweat.

Discussion

There is no doubt that the majority of medical material encountered in the almanacs falls into the category of domestic medicine, a term which was very widely used in the latter half of the 18th century, resulting from the popularity of Buchan's celebrated book. As the term included all ailments which might, wisely or unwisely, be treated in the home, the variety of suggested remedies is extraordinary. There are miscellaneous recipes for the commonly employed remedies, taken either from popular herbals, or evolved over years of household experience, the latter being a notably variable quality. A description of each remedy would entail a vast review which does not come within the scope of this paper, nevertheless, each item has been recorded in a simplified form, together with a detailed bibliographical description, in another work.[6] The items collected from the almanacs have their own inherent value as indices of mortality and morbidity in Colonial times and serve as an indication of the most frequent causes of disease among the early settlers.

Not all the medical prescriptions were accepted by the Colonial American without criticism. Perhaps the most severe condemnation appeared in *Der Republikanische Calender* for 1779 calculated by David Rittenhouse. In the preface the editor, T. Cossart, states that, ". . . Tested remedies for the ailments of mankind we do not have this time; however since it is the style to be sick occasionally, we will gladly in the future also accommodate our readers in this direction when we can learn that there are still people of the opinion that more good results from these prescribed medicines, than [evil from] their stupid application. . ."

In the light of this criticism it should be borne in mind that although many articles included in the almanacs were of great interest and some marked medical milestones, a large proportion of the remedies were old-fashioned even when they made their appearance in the almanacs, having been first published a good

many years previously. Of course, that is not to say that the remedies in question were not still considered effective.

SUMMARY

In the Thirteen Colonies the relatively small number or, in some cases, the superficial education of Colonial medical practitioners, and the fact that the rural population was spread over an extensive area, led to the widespread popularity of a most interesting type of publication with medical material which has been unjustifiably neglected by bibliographers and historians alike—the Colonial almanac. More than 1,500 titles are known to have been published before 1783, in English, German, Dutch, and French. The vast majority of these almanacs had a section on astrological medicine which was usually accompanied by a cut depicting the influence of the signs of the Zodiac on the various portions of the human anatomy, together with indications as to the propitious and unpropitious times of the year for bleeding and cupping. The emphasis on theories of astrological medicine is particularly remarkable in the German almanacs which appeared in Pennsylvania, and which are reminiscent of the *Aderlass-Kalender*.

In most instances, the North American Colonial almanacs contain small treatises on domestic medicine, or recipe books for extremely simplified therapeutics, but in some cases they are important sources of bibliographical information about rare medical publications. In addition fascinating facts are encountered dealing with multiple aspects of the medical sciences, such as the care of the teeth, the treatment of smallpox, diphtheria, consumption, gout, rheumatism, rabies, yaws, and syphilis, which was sometimes referred to as scurvy. An historically valuable chronology of epidemics can be drawn up from items in these almanacs, and an estimate made of the ravages caused in Colonial times by smallpox, diphtheria, measles, typhoid fever, and other infectious diseases. The topic of materia medica occupied many pages in some almanacs, and these articles included not only information culled from European herbals, but also original descriptions of the properties of indigenous American medicinal plants. The almanacs were the first publications to offer therapeutic procedures invented by Negroes; they contained the best information available on matters of veterinary medicine and the control of epizootics; and they also carried the first advertisements for patent medicines which, in two centuries of fantastic growth, were to produce in America "The

Golden Age of Quackery." Because the rural population was so widespread in Colonial times, these almanacs were, in innumerable cases, the only source of medical information available to settlers and were therefore the most widely used reference material in matters of health and public and private hygiene.

For these reasons the addition of more than five hundred medical almanacs, printed in the American Colonies before 1783, to the other, generally accepted, medical imprints seems more than justified.

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Federal Public Health:
A Reflection of a Changing Constitution

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It has long been accepted that protection and promotion of the public health are duties and privileges of any responsible government. Yet, our federal constitution does not provide a single reference to health. This does not mean that the founding fathers were not concerned with the public health, but it does indicate that they did not consider it a responsibility of the national government. They drew a distinction between "nation-wide" problems and "national" problems. For more than three quarters of a century following the founding of this nation, the federal government refrained insofar as possible from assuming responsibilities for the public health. The reasons were deeply rooted in a philosophy of government contained in Article X which reserved for the states those powers which had not been delegated to the federal government. In short, the major police powers were retained by the several states.[2] The powers of police permit the exercise of those actions necessary for the preservation of the government, maintenance of order, and the health and welfare of the inhabitants. The major responsibility for insuring the public health would then be within the province of state government, except as it might be delegated by the state to lesser units of government. The federal government would retain police powers directly pertinent to public health in areas where it exercised exclusive jurisdiction such as federal properties and territories. The main entry, therefore, of the federal government into the field of public

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[1] The writer was supported by a traineeship from the Public Health Service (No. 58-432) during a portion of the period spent in the preparation of this paper.

[2] An antithetical view is supported by evidence that states per se did not delegate power to the federal government. Quite the contrary, the Union is older than the states which were, in fact, formed from royal colonies by a national Declaration of Independence. It should be noted that the delegates to the Constitutional Convention met under the Articles of Confederation "for the sole purpose of revising the Articles." The delegates dismissed such purposes and without authority and in defiance of the Articles proposed a new Constitution of national government. Further, the Constitution would become operative when approved by Conventions elected for that purpose in nine states. It by-passed assent of the Congress of the Confederation and the legislatures of the several states under whose authority the meeting was convened and went directly to the one-seventh of the adult male populace having the property qualifications for the franchise. See John R. Rood, *The history of building the Constitution of the United States*, Detroit, Michigan, Detroit Law Book Co., 1948, pp. 23 ff.

health was contained in its enumerated powers. These powers were expanded subsequently by interpretations which recognized the existence of certain powers implied from the original delegation of authority. Thus, the majority of federal enactments concerning public health would be indirect and incidental to the exercise of federal responsibility in more clearly defined areas.

The field of public health, as many other areas of government, has reflected directly the changing concepts of federal-state-local government authority. Its main significance for public health has been the synonymity of centralization of authority at higher units of government with the improvements in character and scope of public health programs. Concurrently, it emphasizes and perhaps exaggerates fear that loss of local and state autonomy coincident with expansion of centralized authority will result in arbitrary rule and loss of our liberties. However, the principle of democracy demands merely that government be constituted in accord with the will of the majority. Minorities, as individuals, remain protected by virtue of legislative limitations contained in the Constitution which guarantee basic liberties. The fact that authority may be placed in the federal government whereas it had previously resided in state government does not remove the basic repository of power from the people. The test of democracy relates to the extent to which the least assertive, the most underprivileged, the weakest member of society can participate in and receive the protection and benefits of the land. It is obvious that Rousseau's concept of individual liberty, practised in 1961, would result in anarchy and tyranny. As humanity becomes condensed in populous communities, restrictions on individual liberties become necessary in order to maintain the protection of the group. It is thus somewhat paradoxical that, through restraint, liberties are protected for group members as a whole. It has been observed that in an increasingly complex society of growing population, state governments are often unable to provide their citizens with adequate protection and the responsibility is assumed on a governmental level commensurate with the problem.

Social and Economic Factors of Change

The current role of the federal government is vastly different from the role it exercised in the initial stages of our national existence. Legally, this change has occurred as an integral part of constitutional development through the process of amendment, the

enactment of legislation applying in detail the general principles of the Constitution, judicial review interpreting the principle of implied powers, and custom or usage. Since the Constitution is regarded as an organic document determining permissable behavior in 1961 although composed in 1787, it is apparent that great changes have occurred because external facts to which the document is applied are different.[3] The provision for federal public health services, then, is one of many derivatives of these changing facts.

Rosen points out that the history of public health deals with two components: (i) the development of medical science and technology, and (ii) the application of such knowledge which is dependent upon economic and social factors.[4] This writer would prefer to view the development of medical science and technology as a part of general scientific and technical developments which affect society and are affected by it. This is likely incidental, for Rosen clearly illustrates an interrelationship between technology and society, and between socio-economic factors and provisions for the public health.

At the time of the Revolution two and one-half to three million colonists occupied thirteen Atlantic seaboard beachheads facing a border of one-thousand miles of Appalachian wilderness. A number of communities occupying sparsely populated sections, connected by questionable roads and suitable waterways, were sustained largely by agricultural pursuits. The social and economic conditions of these communities were as diversified as their geographical isolation. Unity was more nominal than practical. Consequently, the maintenance of local independence or state sovereignty became a necessary part of the national Constitution. Yet the states did possess a common concern about foreign intervention, protection of commerce, exploitation of the frontier and other natural resources, and promotion of the general welfare. Their inhabitants typically were small farmers, although a small wage-earning class of citizens and unskilled labor existed in the towns. The leaders, an aristocracy of wealth and breeding, were the land proprietors, plantation owners, and seaboard merchants.

Regardless of the individual reasons for their presence on this seaboard, English mercantilism dictated their general arrival. The

[3] See Arthur W. Machen, Jr., "The elasticity of the Constitution," *Harvard Law Rev.*, 1900, *14*, Nos. 3 and 4.

[4] George Rosen, "Economic and social policy in the development of public health," *J. Hist. Med.* 1953, *8*, 406-430.

conflict of mercantile interests with the mother country was a precipitant of the Revolution, and mercantilism served as a basis for a dominating concern of the ruling class for a strong central government. Thus, a second part of the Constitution sought to establish an increase in national sovereignty. The compromise between states' rights and national sovereignty was a federal instrument in which no party was fully content.

The increase in the power of all government, and in the power of the federal government in relation to the states, was inevitable. The movement of our population to the frontier, which began with our first settlers and continues to the current concept of the New Frontier, produced a fluid, dynamic society whose problems could be met and resolved only through federal intervention. The westward expansion demanded improved means of communication and transportation, and these were provided by an industrial revolution which began prior to the Civil War. This revolution produced rapid and profound changes in manufactures and agriculture during the latter portion of the 19th century. These have continued at an accelerating rate and have resulted in a new society with new facts, problems, solutions, and *Zeitgeist.*

In contrast to our national beginnings, our population has increased sixty-fold; thirteen poor and isolated colonies have grown to fifty wealthy states connected by slivers of concrete and high grade steel, airways, and instant communications; gross national production has jumped several hundred-fold; towns and wilderness sites have become metropolises with populations greater than the entire United States of 1787 (the migration to the West has been succeeded by a migration to the city); agriculture has extended and become mechanized, but the agricultural character of the population has been submerged by greater urban industrial development; sectional social and economic interests and differences have been softened, fused, and tempered into a national mold. These are merely suggestive, rather than exhaustive, of the changes which separate today and yesterday.

In relation to the public health, it is apparent that the "same process that created the market economy, the factory and the modern urban environment also brought into being the health problems which made necessary *and possible* new means of health protection and disease prevention."[5] Many of the new means of

[5] *Ibid.*, p. 422 (Italics added).

health protection and disease prevention could be exercised only by the national government.

The assumption of such responsibilities by the federal government has been challenged primarily on the bases of trespass of states' rights and trespass of individual rights. The principles for interpretation of state and national relationships reached a state of maturation before the War of Secession which was fought to preserve rather than change these relationships. This War proved conclusive on the question of constitutional law. The doctrines so important in controlling the relationship of private and corporate persons and the government were largely developed antecedent to the growth of big business and monopoly capitalism. This had been the period of *laissez-faire,* propounding a distorted version of natural law, extolling individualism, and reducing government to the role of handmaiden and facilitator of individual fortunes at public expense. Corwin writes:

> The *laissez-faire* theory . . . was not the gift solely of the Manchester School of Political Economy—it also owed much to the biological doctrine of Evolution. Adam Smith's great work, *The Wealth of Nations,* appeared the same year as the Declaration of Independence—Mill's Political Economy was published in 1857, to be followed two years later by Darwin's world shattering *Origin of Species.* As elaborated particularly by Herbert Spencer and his American disciple John Fiske, the evolutionary conception reinforced the notion of governmental passivity immensely. It was certainly reassuring to know that competition in the economic world was matched by "the struggle for existence" in the biological world, and that those who survived the latter struggle were invariably "the fittest," since that showed that those who were most successful in economic competition were likewise "the fittest."[6]

According to the proponents of *laissez-faire,* government regulation of public health intervened in the process of natural selection. The opponents of Social Darwinism could point out that *laissez-faire* substituted a private collectivism for individualism which was "characterized by monopolistic control very similar to that from which the theory of *laissez-faire* was originally devised to rescue freedom."[7]

An approximate conformity to the theory of *laissez-faire* was sustained in the face of rising industrialism by the reconstruction administrations. The 20th century introduced an era of social welfare and public health legislation which was opposed in part by

[6] Edward S. Corwin, *Constitutional revolution, Ltd.,* Claremont, California, Claremont Colleges, 1941, pp. 82-83.

[7] Benjamin R. Twiss, *Lawyers and the constitution: How laissez faire came to the Supreme Court,* Princeton, New Jersey, Princeton University Press, 1942, p. 258.

conservative administrations of the post-World-War-I years and by the Supreme Court of the Franklin D. Roosevelt administration in a last ditch defense of *laissez-faire*. Currently, it is generally accepted that the federal government has the responsibility for ensuring national health and social welfare.

Judicial Review

The continuing change in the role of the national government has been mechanically possible as a result of the generality of the powers given to the federal government by the Constitution. Their general nature requires continuous interpretation by the courts. The result is that many provisions of the Constitution can be known only by examining the list of decisions, i.e., Constitutional law. The process of judicial review is unique to this nation in that it permits the judiciary to declare acts of Congress unconstitutional. In actuality, the only original jurisdiction guaranteed to the Supreme Court pertains to cases affecting ambassadors, public ministers, consuls, and those to which a state is a party. Its appellate jurisdiction is subject to such exceptions and exercised under such regulations as Congress shall make.

The first claim to the right of judicial review was apologetically presented in 1792 when judges of several federal circuit courts indicated to George Washington that in their opinion an Act recently passed by Congress was not legal.[8] Two years later the Supreme Court declared an Act of Congress unconstitutional but supported their right to make this decision with no formal argument.[9] In 1803, John Marshall declared a Congressional Act invalid and laid down the principles which established the right of the Supreme Court to nullify Acts of Congress which it considered to be a violation of the Constitution.[10] "In this case in which a Congressional statute was held to violate the Constitution, the statute was written by men who helped to write the Constitution while the decision was that of a man who had not taken part in that historic process."[11] It could only be interpreted as a judicial version of the meaning of the Constitution and not a protection of original meaning or intent. It was bitterly resented by Jefferson,

[8] *Heyburn's Case*, 2 Dall. 409.

[9] *United States v. Yale Todd*, note to *United States v. Ferreira*, 13 How. 52.

[10] *Marbury v. Madison*, 1 Cranch 137, 2 L. Ed. 60.

[11] Benjamin F. Wright, *The growth of American constitutional law*, Boston, Houghton Mifflin Co., 1942, p. 37.

but the Court remained, with a few subsequent exceptions,[12] the final determiner of the law.

The lesson to be derived from a brief glance at judicial review is that the political philosophy of the Supreme Court does not always reflect the political temper of the times. A static, mechanistic, philosophical interpretation of the Constitution had been a deterrent to implementing broad social health legislation required by a dynamic society. Fortunately, the public of a dynamic and democratic society can reach into the legislative halls and judicial chambers and be heard. When the political climate demands changes, meanings of the Constitution also change. As Dunne's Mr. Dooley so aptly said: "Th' Supreme Coort follows th' illiction returns."[13] True, changes in accordance with the will of the electorate were often delayed but ultimately they did occur.

THE CONSTITUTIONAL DOCUMENT AND FEDERAL PUBLIC HEALTH

It is suggested that our attention be focused on specific clauses of the Constitution upon which federal health powers are based and note some of the changes which have occurred. Since the document contains no reference to health, each of these powers is viewed by inference. The Articles which have been of primary significance to federal public health are those which assign the national government power to: (i) regulate foreign and interstate commerce, (ii) establish a postal system, (iii) exercise exclusive jurisdiction concerning federal territories and properties, (iv) contract treaties with foreign nations, (v) provide for the nation's defense, and (vi) levy taxes and provide for the general welfare. It is also presumed that significant public health powers would be available to the national government through exercise of the census clause and full faith and credit clause of the Constitution, although no meaningful attempt to assert such power has been made.

12 In 1832 when the Supreme Court ruled that the State of Georgia had no jurisdiction over the Cherokee Nation within its borders, the State of Georgia refused to appear before the Court or obey its mandate. *Worcester v. Georgia*, 6 Wheaton 264. Jackson reputedly remarked, "John Marshall has made his decision, now let him enforce it." Marshall never did.

During the Reconstruction, Congress set up a military government in the South in violation of a Supreme Court decision. When the validity of the legislation was challenged, Congress deprived the Court of jurisdiction of the case. The Supreme Court held that this action was within the powers of Congress and refrained from judging the constitutionality of military reconstrutcion acts. *Mississippi v. Johnson*, 4 Wallace 475; *Georgia v. Stanton*, 6 Wallace 50; *Ex parte McCardle*, 7 Wallace 506.

In 1869 President Grant exercised his power to change the membership of the Supreme Court so that an Act of Congress declared unconstitutional was reversed. *Hepburn v. Griswold*, 8 Wallace 603, reversed by *Legal Tender Cases*, 12 Wallace 457.

13 Finley P. Dunne, *Mr. Dooley's opinions*, New York, Harper & Bros., 1906, p. 26.

ARTICLE I. SECT. 2, PAR. 3. The census clause stipulates that *enumeration shall be made . . . within every . . . term of ten years in such manner as [Congress] shall by law direct . . . .* Accordingly, the Bureau of Census has collected data relative to various health problems such as blindness, deafness, and mental disease. It would appear that if the nation has the power to collect such data, it must have the power to do so completely, i.e., the national government would have the right to collect information concerning the health circumstance of births and deaths, accident and morbidity statistics. Such vital statistics required for the bookkeeping of public health are not collected now nationally; rather, some of this information is forwarded to the federal government upon the option of the states. This has resulted in a lack of uniformity and completeness in our national vital statistics. In short, it appears that although the federal government possesses Constitutional authority to exercise this function, it has not done so.

ARTICLE IV, SECT. 1. *Full faith and credit shall be given in each State to the public acts, records, and judicial proceedings of every other state. And the Congress may by general laws prescribe the manner in which such acts, records and proceedings shall be proved, and the effect thereof.* This means that an activity detrimental to the public health and illegal, for example, in Ohio, could not be practised in Pennsylvania specifically in order to evade Ohio laws. As an illustration, uniform marriage laws requiring premarital blood tests for syphilis might be made universal under this clause if this were considered desirable from a public health point of view. However, the federal government has not attempted to assert such authority. In practice, this means that interstate attempts to enforce uniform public health statutes would require interstate compacts. Such uniformity as now exists is traceable to federal control authorized by other Articles and influence exercised on the states by the nation through the grants-in-aid program.

ARTICLE I, SECT. 8, PAR. 3. The commerce clause empowers Congress *to regulate commerce with foreign nations, and among the several states and with the Indian tribes.* This power delegated to the U. S. represents one of the major purposes of the founding fathers—to establish a central government with adequate positive authority over the commercial life of the nation.[14] But governed

[14] David Fellman, *Readings in American national government,* New York, Rinehart and Co., 1947, p. 214.

by the idea of states' rights which was then justified by existing economic conditions, Congress and the Supreme Court viewed national powers narrowly.[15] By 1820 it was necessary for the national government to make provision for communication between eastern and inland or Mississippi Valley states. Congress built roads and permitted them to be administered by the states. By 1824, in the first important case involving federal interstate powers, the Court held that the commerce power included authority to regulate navigation.[16] In later cases, the Court took the view that the power of Congress was not restricted to those instruments of commerce which were in use when the Constitution was framed, rather that it was an expanding power designed to "serve the needs of an ever changing society."[17] The definition of the terms "commerce" and "regulate" has been expanded accordingly. Commerce now includes physical instrumentalities by which it is carried on, transactions on which trade relations are based, and manufacturing where it is necessary to regulate effectively transactions or physical instrumentalities. This regulating power includes construction of routes, the right to make contracts, charter companies, issue licenses, prohibit commerce in certain articles and prohibit certain methods of commerce. These powers have diminished the distinction of commerce among states and within states so that the authority of the national government in the field of commerce is almost complete. It permits not only the promotion of commerce but its limitation as well for purposes of public health.[18] Inspection, embargo, and quarantine prohibit passage of persons and articles dangerous to public safety.

The change from the initial timid assertions of federal powers under the commerce clause to the present extensive assertions of federal powers can be seen by comparing the nature of the earliest public health legislation with current public health activities as carried on by law. Quarantine procedures serve as an apt illustration. The earliest public health legislation reflected the Congressional position that health control essentially resided in the states, except where the national government held exclusive powers regulating foreign commerce and powers within its territories. The first public health legislation in 1790 was not too important. It merely provided that each vessel of more than 150 tons

15 Frank Goodnow, "Constitutional foundations of federal public health functions," *Amer. J. Pub. Health*, 1919, 9, 562.

16 *Gibbons v. Ogden*, 9 Wheaton 1.

17 Fellman, *loc. cit.*

18 Goodnow, *op. cit.*, p. 563.

in voyage outside the limits of the United States would carry a medicine chest (1 Stat. L. 131). The second public health law enacted four years later authorized Congress to convene at a place other than the Capital in times of epidemic (1 Stat. L. 353). This was quite understandable since, at the time, Philadelphia was subject to a series of yellow fever epidemics. The important factor in this was that although Congress provided to remove itself from the scene, it proposed to do nothing about the epidemic. It would be a mistake, however, to infer that Congress was unconcerned about the situation; rather, it regarded the problem as one to be met by state action. In 1796, the first Quarantine Act was passed. It provided for federal cooperation with the states and localities in enforcing their quarantine measures in regard to shipping (1 Stat. L. 474). The original bill provided for federal authority in quarantine procedures on the basis that importing epidemic disease affected the entire nation, affecting not only the populace of cities but obstructing the commerce of several communities and injuring the revenues of the United States. The original bill had been defeated, 46-23, on the basis that each independent state had the right to formulate its own legislation.[19]

Epidemics were regular occurrences in the early days of the Republic. John Adams began his second annual message to Congress in 1798 by referring to the pestilence of yellow fever and urged federal laws to aid the health of the people within the states. It was nearly a hundred years before another President made such a direct recommendation. Despite the direct plea of the President, Congress merely enacted legislation in 1799 supplanting the Act of 1796 which did little more than recognize state rights over quarantine and again authorize cooperation (1 Stat. L. 619). Jefferson seems to have dodged the issue. In a message to Congress he mentioned epidemics in two cities but stated only that "although the health laws of the states should be found to need no present revisal by Congress, yet commerce claims that their attention be ever awake to them."[20] Monroe in 1825 related to Congress: "this being the seat of government, its protection against disease must form one of its principal objects."[21] Reminiscent of Philadelphia days, Congress took no action regarding quarantine. Van Buren,

[19] Harry S. Mustard, *Government in public health*, New York, The Commonwealth Fund, 1945, pp. 49-57.

[20] Thomas Jefferson, *Fifth annual message to Congress*, 3 Dec. 1805, in *Annals of the Congress of the United States, Ninth Congress*, Washington, Gales and Seaton, 1852, p. 11.

[21] James Monroe, *Message to Congress*, 17 Feb. 1825, in *Register of debates in Congress, 18th Congress, 2nd Session*, Washington, Gales and Seaton, 1825. Vol. 1, p. 623.

Tyler, Pierce, Johnson, and Grant sent messages to Congress concerning public health, but these were minor matters and not forcefully presented.

Congress passed an Act in 1832 which allowed the Secretary of the Treasury to aid the states in the enforcement of quarantine laws (4 Stat. L. 577). In 1866, an appropriation from the national treasury was authorized for the purpose of aiding the states in the enforcement of their quarantine regulations (14 Stat. L. 357). Neither Act provided for federal quarantine procedures. Thus, during the first three-quarters of the 19th century, public health quarantine procedure consisted merely of federal-state cooperation as provided by the Acts of 1796 and 1799.

In 1878, Congress permitted quarantine rules and regulations to be prescribed by the Surgeon General but within the same Act made this provision inoperative by stating that the rules and regulations "shall not conflict or impair any sanitary or quarantine laws or regulations of any state or municipal authorities now existing or which may hereafter be enacted." (20 Stat. L. 37). The national government carefully continued to avoid conflict with state authority but at great cost to the public health. President Hayes, spurred by the great yellow fever epidemic of 1878—the nation's worst recorded epidemic—finally recommended federal quarantine. Congress responded to Hayes's message by creating the National Board of Health in 1879 with power to enforce interstate quarantine measures in respect to cholera, yellow fever, smallpox, and plague (20 Stat. L. 484; 21 Stat. L. 5). National Board powers lapsed four years later, but the Board continued a rather jobless existence until 1893 when it was dissolved.[22] Public opinion continued to press for national quarantine control. In a court case during 1886 involving the right of a state to charge fees for quarantine services, the Supreme Court took the unusual step of criticizing Congress for not assuming federal responsibility in quarantine. The Court said:

> For the period of nearly a century since the government was organized, Congress has passed no quarantine law, nor any other law to protect the inhabitants of the United States against the invasion of contagious and infectious disease from abroad; and yet during the early part of the present century, for many years the cities of the Atlantic Coast, from Boston and New York to Charleston, were devastated by yellow fever. In later times the cholera has made similar invasions; and the yellow fever has been unchecked in its fearful course in the Southern cities. . . . During all this time

[22] James W. Garner, "Federal activity in the interest of public health," *Yale Rev.* 1905, *14*, 195.

the Congress never attempted to exercise this or any other powers to protect the people from the ravages of these dreadful diseases. No doubt they believe that the power to do this belonged to the states. . . .

But it may be conceded that whenever Congress shall undertake to provide for the commercial cities of the United States a general system of quarantine . . . all State laws on the subject will be abrogated, at least so far as the two are inconsistent. But, until this is done, the laws of the State on the subject are valid.[23]

Congress belatedly accepted the suggestion after seven years in its enactment of the Quarantine Act of 1893 (27 Stat. L. 449). Although recognizing regulation of state and municipal authorities, it frankly stated for the first time that such regulation must conform with national law. It permitted national quarantine control to supersede control by the respective states although this power has been rarely exercised.[24] The Act also provided for the purchase of municipal and state quarantine stations if necessary to the nation. In 1920, the Port of New York became the last station absorbed (41 Stat. L. 875). Thus, our current quarantine program was established with the states administering interstate quarantine subject to national law and foreign quarantine being conducted by the national government.

The reluctance of the federal government to assume the quarantine function until the final quarter of the 19th century was merely a part of its general reluctance to assume interstate commercial regulatory responsibilities. However, when the Supreme Court in an 1886 decision[25] invalidated state regulation of interstate commerce as an infringement of the national government, legislative action became imperative. Congress responded by passing an Interstate Commerce Act in 1887 (24 Stat. L. 379), resulting in the first modern administrative board of the American government, the Interstate Commerce Commission. Administrative regulations were still alien to the American concept of government, and the federal courts insisted on the right to review orders of the Commission. By successive decisions of the Court, Interstate Commerce Commission powers were removed until the Commission became an ineffectual body.[26] Abandoned by Congress and ignored by three successive Presidents,[27] the Interstate Commerce Act of 1887

[23] *Morgan's Louisiana and Texas R. R. and Steamship Co. v. Louisiana State Board of Health*, 118 U.S. 455, 6 S. Ct. 1114, 30 L. Ed. 237.

[24] Plague in San Francisco during early years of the 20th century and in 1916 poliomyelitis epidemic in New York.

[25] *Wabash, St. Louis and Pacific R.R. Co v. Illinois*, 118 U.S. 557.

[26] Samuel E. Morison and Henry S. Commager, *The growth of the American Republic*, New York, Oxford University Press, 1942, Vol. II, p. 119.

[27] Harrison, Cleveland, McKinley.

was disinterred by Theodore Roosevelt. The Hepburn Act of 1906 authorized the national Executive branch to determine and prescribe interstate freight rates. There followed the introduction of other regulatory agencies of government so important to public health. Beginning with meat inspection and pure food and drug control in 1906, there were added, among others, agencies concerned with stream pollution, water rights, nuisance control, milk and food supervision, industrial conditions affecting health, animal diseases, narcotics, white slaves, false labeling, and misleading advertising.[28] The list is conglomerate and fragmentary, but it illustrates a few of the federal public health functions exercised under interstate commerce authority as permitted by a broadened interpretation of federal powers.

The public health purpose made no significant advance in the important area of child labor legislation. When the Supreme Court held in 1895 that the Sherman Anti-Trust Act could not apply to the manufacturing process, the pattern of constitutional interpretation of the commerce clause for the next four decades was established.[29] It meant the Court had drawn a fine line between commerce and manufacturing. In 1918 the Court invalidated a federal child labor law on the theory that it was actually a regulation of conditions of production.[30] A later attempt at enacting child labor legislation under taxation powers was also invalidated,[31] and constitutional amendment efforts came to naught. The National Industrial Recovery Act and the Guffy Coal Act were invalidated in 1935 and 1936, respectively,[32] on the same basis as the 1918 decision. In 1937 the Court reversed its previous position by its decision in the famous *National Labor Relations Board v. Jones and Laughlin Steel Corporation* case (301 U.S. 1), stating that the regulation of labor relations at the plant was within the scope of the commerce clause. This decision removes any constitutional hinderance to child labor legislation, but it is no longer a major public health issue. The importance of the decision is that it represents a victory for the modern dynamic interpretation of the Constitution and represents a turning point in the

[28] "If administrative agencies did not exist in the federal government, Congress would be limited to a technique of legislation primarily designed to correct evils after they have arisen rather than to prevent them from arising." *Administrative Procedure in Government Agencies*, Senate Document No. 8, 77th Congress, 1st Session, 1941, pp. 11-18.

[29] *U.S. v. E. C. Knight*, 156 U.S. 1.

[30] *Hammer v. Dagenhart*, 247 U.S. 251, 38 S.Ct. 529, 62 L.Ed. 1001.

[31] *Bailey v. Drexel Furniture Company*, 259 U.S. 20, 42 S.Ct. 449, 66 L.Ed. 817.

[32] *Schechter Poultry Corporation v. U.S.*, 295 U.S. 495; *Carter v. Carter Coal Company*, 298 U.S. 238.

evolution of basic constitutional doctrine.[33] The notion of government as a necessary evil could be supplanted by an appreciation of government as a servant of the people and the instrument of national health and welfare.[34]

ARTICLE I, SECT. 8, PAR. 7: Congress shall have power *to establish Post Offices and Post Roads.* Federal postal authority has been a monopoly since its inception. It has operated as a monopoly, formulating such regulations as deemed necessary to providing mail services to the public on a beneficial basis. Thus, it has excluded from the mails such things as injurious foods, medicines, illegal drugs, misleading advertising, and other injurious substances and tracts. Court decisions have substantially reaffirmed postal authority in this area.

ARTICLE I, SECT. 9: *To exercise exclusive legislation in all cases whatsoever, over such District . . . as may . . . become the seat of government of the United States, and to exercise like authority over all places purchased by the consent of the legislature of the state in which the same shall be, for the erection of forts, magazines, arsenals, dock yards, and other needful buildings.*

ARTICLE IV, SECT. 2, PAR. 4: *The Congress shall have power to dispose of and make all needful rules and regulations respecting the Territory or other property belonging to the United States.* Federal power of exclusive jurisdiction is essentially concomitant with the power of police. It should be recalled that police powers were possessed by the separate states prior to the adoption of the Constitution and were not relinquished by them. Amendment X reserved police powers for the state subject to Constitutional limitations. However, since self-preservation is regarded as the first law of nature and *salus populi suprema lex est* are dicta recognized by common law, police power assumes precedence over the Constitution when necessary for the health and welfare of the people. Articles I and IV did not confer police power upon the national government for it is, in actuality, an inherent function of government necessary to its survival.[35] Rather, it mapped out an area in which federal police powers might be exercised. The awesome bounds of police power whose limits perhaps cannot be prescribed are attested to by the fact that state police has been deter-

[33] Fellman, *op. cit.*, p. 215.
[34] Henry S. Commager, *The American mind*, New Haven, Conn., Yale University Press, 1950, p. 641.
[35] Henry B. Hemenway, *Legal principles of public health administration*, Chicago, T. H. Flood and Co., 1914, p. 88.

mined as superior to the regulation of commerce.[36] It can be legally exercised even if it stops navigation[37] or interferes with a foreign treaty entered into by the United States.[38] The police power may override provisions of the Constitution which guard the sanctity of contracts,[39] freedom of person,[40] due process of law,[40] and property rights.[41] Ordinarily, private property may not be taken or destroyed without due compensation; or private individuals pressed into public service, especially without compensation. However, the Courts have upheld this action as proper when exercised for the protection of the community. This power cannot be exercised arbitrarily, all usual legal means being first exhausted or deemed inapplicable to the problem. In fact, whenever the health of the community is at stake, contrary rights of the individual are superseded. The only limits, if any truly exist, to such power are the necessity for reasonableness and validity in its exercise as a public health measure.

ARTICLE II, SECT. 2, PAR. 2: The President *shall have power, by and with the advice and consent of the Senate, to make treaties, providing two-thirds of the Senators concur . . . .*

ARTICLE VI, SECT. 2: *. . . and all treaties made, or which shall be made, under the authority of the United States, shall be the Supreme Law of the Land.* There have been two opposing views as to the extent and limits of treaty authority—one which asserts that arbitrary power exists; the other which limits the subjects of treaties to other delegated national powers. In practice there have been few instances in which federal-state conflict occurred or where due process of law has been questioned. When such conflicts have appeared, the Courts have found no limitations on the treaty power.[42] An early illustration of the use of the treaty power for purposes of public health is seen by the several treaties with Indian tribes committing the Federal government to provide certain health services to the Indians. The first such provision occurred in 1832 as a partial payment for Winnebago Indian property, and by

36 *Smith v. St. Louis and Southwestern Ry. Co.*, 181 U.S. 248.

37 *Leovy v. U.S.*, 177 U.S. 621; *Wilson v. Blackbird Creek Co.*, 2 Pet. 245; *Gilman v. Philadelphia*, 3 Wall. 713.

38 *Compagnie Francaise de Navigation a Vapeur v. Louisiana*, 186 U.S. 380.

39 *Boston Beer Co. v. Mass.*, 97 U.S. 25; *Stone v. Miss.*, 101 U.S. 814; *Boyd v. Ala.*, 94 U.S. 645; *Butcher's Union Slaughterhouse v. Crescent City Livestock Land Insurance Co.*, 111 U.S. 746; *Kreses v. Lyman*, 74 Fed. 765.

40 *Sears v. Gallatin County*, 20 Mont. 462.

41 *Bass v. State*, 34 La. Ann. 494; *Eldridge v. Trezevant*, 160 U.S.

42 See, for example, *Fairfax's Devise v. Hunter's Lessee*, 7 Cranch 603; *U.S. v. Curtis-Wright Export Corporation*, 299 U.S. 304; *Missouri v. Holland*, 252 U.S. 416; *Wilson v. Girard*, 254 U.S. 524.

1871 at least two dozen treaties provided for some kind of medical service to various tribes. Most of the Indian treaties limited medical services to five or ten years, but the government adopted the policy of continuing services.[43] The other major significant use of the treaty power in aid of public health was contained in a 1926 commercial treaty with Germany empowering the consuls of both nations to inspect all vessels at ports within their districts with a view to more effective enforcement of quarantine regulations (44-Part 3, Stat. L. 2155). However, if public health should become a matter of international regulation through conventions with foreign nations, the treaty power may become a very important basis for public health activity on a national level.[44]

ARTICLE I. SECT. 8, PARS. 11-14,16: Congress shall have the power *to declare war . . . to raise and support Armies . . . to provide and maintain a navy. To make rules for the regulation of land and naval forces . . . to provide for organizing, arming, and disciplining the militia, and for governing such part of them as may be employed in the service of the United States.* In time of peace this power has generally been restricted to providing the armed forces with medical protection and care for its personnel. It had been used as the basis for beginning federal health services for Indians. This began about 1802 or 1803 when Army physicians took measures to curb smallpox and other contagious diseases among Indians in the vicinity of the military posts.[45] In times of military conflict, the war power legalizes all acts of federal government related to gaining military success. The generous interpretation by the courts of the health aspects of the war power was well illustrated in 1919 when the Supreme Court upheld an order of the Secretary of War forbidding houses of ill fame within five miles of a military establishment.[46] During World War II the war clause served as a basis for extending health and medical care services to certain defense employees and servicemen's dependents. Views on the constitutional implications of this clause have remained rather constant, their application depending upon the exigencies of the military situation rather than changing political thought.

43 U.S. Dept. of Health, Education, and Welfare, *Health services for American Indians* Public Health Service Publication No. 531, USGPO, 1957, p. 86.

44 Robert D. Leigh, *Federal health administration in the United States*, New York, Harper and Bros., 1927, p. 73.

45 U.S. Dept. of Health, Education, and Welfare, *loc. cit.*; and George S. J. Perrot and Margaret D. West, "Health services for American Indians," *Pub. Hlth Repts.*, 1957, 72, 565.

46 *McKinley v. U.S.*, 249 U.S. 397.

ARTICLE I, SECT. 8, PAR. 1: *The Congress shall have power to lay and collect taxes, duties, imposts and excises, to pay the debts and provide for the common defense and general welfare of the United States.* This clause has been variously referred to as the taxation clause, welfare clause, and the appropriations clause. If we view the public health powers which this clause places in the federal government, it should be considered in terms of the taxation and appropriations aspects related to general welfare.

The delegation to Congress of taxing authority ranks with commercial regulation as one of the main objects of the framers of the Constitution. A major importance for public health resides in the levying of excise taxes. It is by way of excise taxation that the national government has authority to regulate goods and persons while it raises revenue. In this respect national authority is not limited to interstate jurisdiction. "If a commodity can be taxed at all by federal authority it may be reached anywhere."[47] However, limitations on federal taxing authority do exist. Although statutes may be regulatory or prohibitory, they must show "on their face" a revenue purpose. In 1886 Congress levied a tax on oleomargarine clearly attempting to discourage, if not to prohibit, its manufacture (24 Stat. L. 209). In 1904 the Supreme Court upheld the statute with the comment that it could not take judicial cognizance of the alleged Congressional intent.[48] It was thus regarded as a revenue measure "on its face." In 1912 a heavy tax was placed on poisonous white phosphorus matches and, although uncontested, this tax is legally analogous to the oleomargarine tax (37 Stat. L. 81). With the Narcotic Drug Act of 1914 (38 Stat. L. 785), the taxation clause was used with a control purpose similar to that in the oleomargarine and match taxes but with a distinctly different revenue aspect. It merely required a nominal tax of one dollar for registration of dispensers of narcotic drugs, but the Court, in *U.S. v. Doremus*, 49 U.S. 86, 94 (1919), was willing to read in the Act a revenue purpose. This meant that by means of nominal license taxes the public health agencies might extend their control to businesses injurious to health where possession of names and records provides a basis for effective legislation. By a curious quirk in logic, a regulatory tax on child labor employers enacted in 1919 (40 Stat. L. 1138) was declared invalid because it was not a bona fide tax,[49] i.e., an act for raising revenue. The

47 Leigh, *op. cit.*, p. 51.
48 *McCray v. U.S.*, 195 U.S. 27.
49 *Bailey v. Drexel Furniture Co.*, 259 U.S. 20, 42 S. Ct. 449, 66 L. Ed. 817.

exact point at which a federal tax law is a tax "on its face" and therefore bona fide has not been clearly defined. The change in political philosophy since the 1922 child labor law decision indicates that public health measures are not significantly limited by the concept of a bona fide tax. Currently, if they serve a public health purpose, they are likely to be regarded as a revenue measure "on their face."

The second aspect of this Article and Section of the Constitution pertains to appropriations. It has been assumed that if the nation possessed means to raise money, it could also expend money for stated purposes, i.e., the common defense and the general welfare. In the field of public health this has served as the basis of providing grants-in-aid to the states and direct health services for promotion of the general welfare. However, the boundaries of the term "general welfare" had not always permitted expenditures for the wide variety of services now current. The term "general welfare" does not define the purpose of the expenditure with reasonable clarity. Its current definition, thus, has evolved with the development of constitutional law.

Divergent views concerning the welfare clause existed in the very antecedents of the Constitution. Hamilton assumed the broad view that it was left to the Legislature to determine "objects which concern the general welfare." His views are clearly presented in *The Federalist* (Nos. 30 and 34) and his *Report on Manufacture,* 1791. Madison argues in *The Federalist* (No. 41) that the general welfare clause restricted objects of spending to the other expressly delegated powers contained in the Constitution. This latter view, or more properly a modification of it, appeared repeatedly to contest outlays for internal improvements up to the time of the War of Secession. Presidents Monroe and Buchanan, holding a modified view, accepted Hamilton's position that objects of expenditure under this clause were not confined to enumerated powers but concluded that they were limited by the Tenth Amendment. The modified view then denies the right of national spending to transgress the field of state sovereignty. Despite Presidential pronouncements of limited spending powers, there occurred a gradual expansion of national appropriations in areas not enumerated by the Constitution. Federal grants for roads, canals, and education were made prior to the Civil War, but the development of federal aid to public health was not an accepted principle.

Federal cooperation in quarantine procedure,[50] federal assistance to education having a public health by-product,[51] and direct federal aid to seamen,[52] general citizens,[53] and Indians[54] were individual events which aggrandized the national concept of the welfare clause but did not serve as an accepted precedent for federal expenditures for the internal improvement of public health. When, in 1854, Congress passed a bill providing land grants to the states for the purpose of providing hospitals and services for the care of the mentally ill, it was vetoed by President Pierce. Pierce's veto message repeated the modified view of the welfare clause stating that the government could not become thus involved in any cause, no matter how humanitarian, when it would usurp the powers of the individual states.[55]

In 1879, the first clearly intended grant-in-aid to state programs for the purpose of promoting public health came to an untimely conclusion. In the Bill creating the National Board of Health which had been passed by the House of Representatives there was contained a provision to extend $500,000 financial aid to the states. The clerk transcribing the Bill for Senate action failed to include this provision.[56] It was thus not until 1916 that public health grants-in-aid on a matching basis occurred. It was specifically designated for demonstration projects in rural sanitation, and the total amount for the program was a modest $25,000 (39 Stat. L. 21). The passage of the Sixteenth Amendment in 1913 established the federal income tax and opened the way for a tremendous expansion of national expenditures and grants. With the passage of the Venereal Disease Act of 1918 there seemed to be an acceptance of federal grants to states as a principle in public health (40 Stat. L. 886).

The gradual expansion of national appropriations in areas not enumerated by the Constitution occurred without being ques-

50 Quarantine Acts of 1796, 1799 and 1832.

51 Land grants for the establishment of the Connecticut Asylum for the Deaf and Dumb (1819) and for a similar institution in Kentucky (1826).

52 Act of 1798 establishing a Marine Hospital Service for the relief of sick and disabled seamen.

53 Act of 1813 which stated that vaccine was to be provided to all citizens at no cost upon receipt of their applications (2 Stat. L. 806). This was repealed nine years later (3 Stat. L. 677).

54 Act of 1832 which authorized vaccination for the Indian tribes (4 Stat. L. 514).

55 Roy F. Nichols, *Franklin Pierce*, Philadelphia, University of Pennsylvania Press 1931, pp. 348-349.

See also Albert Deutsch, *The mentally ill in America*, New York, Columbia University Press, 1952. Deutsch gives a graphic portrayal of the efforts of Dorothea Dix to secure passage of this legislation on behalf of the mentally ill.

56 J. L. Cabell, "Presidential address," *Amer. Publ. Hlth Aso. Papers & Rpts.*, 1880, 5, 1-23.

tioned in the Courts for more than a century and a quarter. This is understandable when one considers that it involved no direct interference with state activities; rather, it doled out benefits to the states and the individuals therein. But in 1923 the Commonwealth of Massachusetts challenged the legality of the Sheppard-Towner Act (42 Stat. L. 135).[57] A suit was also entered by a Massachusetts citizen against the United States for taking property by taxation without due process for the purpose of financing this Act.[58] The State claimed that rights guaranteed to them by the Tenth Amendment were usurped. The Supreme Court disposed of both cases without ruling on the legality involved. The Court merely stated that the Commonwealth of Massachusetts and the taxpayer were "without status in the premise" (having no basis for suit). The decision in the case of the Commonwealth hinted at the constitutionality involved. It held that the Commonwealth could not be a party to a suit unless its rights had been transgressed. The grant of funds did not take anything away from the state since the state was free to reject the funds. The obvious corollary that granting monies "with strings attached" exercised a power over the recipient was not deemed to be a case in issue. The method of federal grants then appears to be limited only by determination of public purpose and sanction by public opinion.

In the 1920's national grants to the states were slightly more than $100 million and confined to a few functions. About 75 per cent of the total grants were disbursed for highways.[59] Federal aid for state public health which had lapsed in 1929 was renewed in 1935 under Titles V and VI of the Social Security Act (49 Stat. L. 620). Successive Congresses have curtailed or eliminated certain funds and increased others, but federal financial aid to state public health no longer appears to be on a temporary basis. The present picture is radically different in size, scope, and activity than during the 1920's. The Department of Health, Education, and Welfare portion of grants to the states during fiscal 1960 was more than $2,730,000,000. Public health has shared in this expansion, receiving more than $200,000,000, which has resulted in vast changes in services.[60] It has been the basis of expanded and newly developed programs such as demonstration projects, clinic services for

[57] *Frotheringham v. Mellon*, 262 U.S. 447.

[58] *Massachusetts et. al. v. Mellon*, 262 U.S. 447.

[59] W. Glen Campbell, "Decentralizing big government," *Amer. econ. Sec.*, 1953, *10*, 23-24.

[60] U.S. Department of Health, Education, and Welfare, *Annual report, 1960*, Washington, D.C., USGPO, p. 9.

diagnosis and treatment, construction of hospitals and facilities, research, health education and training, and consultation.

Since the authority for providing direct health service to individuals is contained in the same Article permitting grants-in-aid, the development of direct health service has been, from a constitutional point of view, similar to the development of grants-in-aid. The same arguments for and against federal appropriations occurred. The familiar proponent of strong central government based on a broad interpretive view of the Constitution, Mr. Hamilton, in a 1792 report to Congress, suggested establishing hospitals for the care of seamen in the interests of navigation and trade. It was the first step in the creation of the U. S. Public Health Service. In 1798 a bill was introduced to establish federal Marine Hospitals for seamen.[61] The matter was referred to the Committee on Commerce and Manufacture as a problem concerning commerce, with health being considered solely as an aspect of the commercial problem. (This was the precedent for a pattern of federal handling of health and medical matters secondly and indirectly until recent years. This pattern has resulted in the wide scattering of health activities among various governmental units of administration.) The passage of the Federal Marine Hospital Act in 1789 (1 Stat. L. 605) has been used as proof that the principle was accepted that the Federal government should provide medical services and hospitalization for certain classes of independent, non-relief persons. It was among the first systems of compulsory insurance against sickness in the world. Yet it would be an error to attribute to the Fifth Congress any intent to institute any far-reaching medical insurance scheme. It was intended to remove from seamen a handicap by which they were unable to receive medical services even commensurate to the degree of care obtained by paupers in their home community. This lack of medical care for seamen posed a serious threat to the nation's commerce. Opposition to the hospital plan was primarily based on the philosophy that the problem was a state responsibility. But it was also clear to the thirteen seaboard states that it would be more practical to have a central plan for support of the endeavor. Practical considerations and exigencies of

[61] This was the American counterpart of the earlier action of the British government in their establishment of the Royal Hospital for Seamen at Greenwich, England, for the purpose of providing care for sick and disabled seamen. Both governments, consistent with prevailing mercantilist values, were motivated toward the provision for such services in the interest of maintaining the economic strength of the nation. The view of British hospital services for seamen as a pattern for adoption by the United States is reflected in the Congressional discussion of the issue. See the remarks of Mr. Parker (H. of R.), 10 April 1798 in *Annals of the Congress of the United States, Fifth Congress,* Washington, Gales and Seaton, 1851, p. 1391.

the situation did, as on subsequent occasions, exert sufficient pressure to modify meanings derived from the Constitution. Political thought still maintained the supremacy of state sovereignty, and the Act accordingly provided for medical and hospital service to be rendered through utilization of local facilities. The records between 1798 and 1870 are fragmentary and incomplete, but it is clear that the venture fared poorly.[62] Leigh states:

> During its first seventy years of activity, the Service had acquired practically all the administrative disabilities associated with Jeffersonian and Jacksonian democracy; its personnel was the subject of party spoils; its purchases of supplies was an adjunct to party machinery; its decentralization and lack of supervision were almost complete; its hospitals were a part of the annual distribution from the Congressional pork-barrel; as a mean of governmentally supervised sickness insurance it was a fiscal failure requiring annual doles from Congress to keep it functioning; on account of enforced parsimony it was also very far from offering any guaranty of medical aid to the sailors even at the principal sea ports.[63]

It was evident that unless far-reaching authority was assumed by the national government, the program would collapse completely. The 1870 revision reviewed the old discussion as to why the government should be uniquely concerned with seamen. In addition to the response concerning their importance to commerce, there had now been added a description of seamen as being the most improvident class of men on earth, a classification which had consequently always been treated somewhat as wards of the government. This argument heralded the application of a concept in federal government responsibility which previously had been exercised only in regard to the Indian population. (Assumption of wardship responsibility has been a matter of necessity or expediency rather than interpretation of the Constitution which is silent on this issue.) Before the end of the century the concept of national responsibility for health services was extended to lepers and immigrants.

As a result of the 1870 revision the new public health corps and its procedures were organized along military lines. The beginning knowledge of bacteriology resulted in a public health focus on research and on preventive medicine. Medical services became centralized in state programs. A program of federal-state co-operation on an organized, systematic basis was instituted. The ground work for the present program of public health medical care service was laid. It required only an extension of the principle of federal

[62] Mustard, *op. cit.*, pp. 32-39.
[63] Leigh, *op. cit.*, p. 92.

responsibility to other categories of individuals to "fill out" the 1870 framework.

In 1918 medical care services were broadly extended to veterans; in 1922 mothers and infants became recipients; in 1935 the dependent blind, dependent aged, and dependent children became eligible for some medical care; in 1950 the permanently and totally disabled were added. Concurrent with this development, outpatient diagnostic and treatment services became available for individuals with communicable diseases such as tuberculosis and venereal disease. In more recent years this has been extended to include various chronic diseases. With the advent of the New Deal there occurred also a federal acceptance of the reciprocal relationship between poverty and ill health. Consequently, the development of national participation in providing public assistance to needful categories of citizens and conducting other income maintenance programs paralleled the broadened extension of direct medical care services. This development was a recognition of the superiority of preventive to palliative measures, and restorative to custodial efforts, as common bases for complementary public relief and public health activities.

The fragmentary inclusion of certain categories of citizens and categories of diseases for certain public health benefits has been a less desirable mode of development than a unified, comprehensive program for the entire citizenry. But it is a natural outgrowth of democratic, constitutional government which brings the central government into the business of public health only at such times and in such particular instances as lesser units of government are unable to perform the general health and welfare duties of government. The increasing role of government, particularly national government, in providing social control for health and other purposes has presented the dilemma of reconciling individual liberty with the changing concept of government. For example, men have many rights, but among them is not included the right to ill health and the transmission of ill health to their neighbors. Katherine Lenroot, in her presidential address to the national social work body in 1935, remarked that "government may prove to be the only (agent) having range and power necessary for dealing with the most complicated and difficult situations." She considered a basic problem of the 20th century to be one of making government "an effective agency of social control."[64] If the state is

[64] As quoted in Frank J. Bruno, *Trends in social work, 1874-1946*, New York, Columbia University Press, 1948, p. 347.

to be "an elected body whose duty was to impose the minimum restrictions and safeguard the maximum liberties of the people," as according to Kant, there would be placed on the state no other obligation than to protect men and police their liberties.[65] Although this is one of the primary attributes, the state must also be positive. The state should be a well-spring for the creative impulses in which all men can share. In public health, the Constitution has been the framework within which such impulses have been directed to effecting an increase in human well-being and dignity.

[65] As quoted in Robert Payne, *Zero*, London, Allan Wingate Publishers, Ltd., 1951, p. 253.

A Lost Neurological Society With Great Expectations*

BYRON STOOKEY**

BURIED in the medical journals of nearly a century ago are reports of the organization and meetings of a neurological society that seems otherwise to be lost to history—the New York Society of Neurology and Electrology. There is no listing of this organization in the extensive file of societies at the New York Academy of Medicine nor do the Academy records contain minutes supporting its existence. The New York State Library in Albany has no record of the group, and no mention of it could be unearthed in the Library files. No minutes were found, and only an occasional reference to the society was encountered in a review of the work of our early neurologists. A search of the contemporary literature, however, uncovered accounts of most of the meetings, and it became evident that here was a society devoted "to the study of Anatomy, Physiology, Pathology and Therapeutics of the Nervous System, and of Electricity in its Relation to Physics, Physiology and Therapeutics," including in its membership—active and corresponding—the great of both American and foreign medicine. Its role in the development of neurology as a specialty should not be ignored.

In the interval between 10 January, 1872, the date of the founding of the New York Neurological Society, the first neurological society on this continent, and its reorganization under the guidance of William Hammond into an active society on 6 April, 1874, the New York Society of Neurology and Electrology was formed 20 November, 1873. It was incorporated 1 January, 1874, and its meetings were scheduled for the third Monday of each month, except July, August, and September.

An earlier group headed by George Beard and A. D. Rockwell, called the Electro-Therapeutic Society, had been formed 20 November, 1871, "for the study of electricity in its relation to therapeutics." This group met occasionally in the members' homes but failed to grow in numbers or to generate any great enthusiasm. Beard tells us that it was consequently decided to dissolve the

* Read before the Beaumont Club, New Haven, Connecticut, 30 October 1959.

** Sharon, Connecticut.

Electro-Therapeutic Society and "try to revive its fading energies by transfusing neurology into its veins. . . . In a moment, as though by a miracle, the society rose to its feet and bounded into lusty life."

The name of the newly formed society was carefully considered. Of electrology Beard said: "[It] is comparatively a new word, though entirely legitimate . . . and neurology is an old, though not much used term." Both neurological societies held their meetings in the College of Physicians and Surgeons, then at Fourth Avenue and 23rd Street. Due to the similarity of names, members of one society not infrequently attended meetings of the other by mistake, but, Beard tells us, "the best of good feelings prevailed."

The officers of the New York Society of Neurology and Electrology were: President, Meredith Clymer; Vice-President, Austin Flint, Jr.; Recording Secretary and Treasurer, Alfred L. Carroll; Corresponding Secretary, John J. Mason; Executive Council, Austin Flint, Jr., John C. Dalton, D. B. St. John Roosa, E. G. Loring, Jr., and George M. Beard. The constitution and by-laws were patterned after the Medico-Legal Society.

Judging from the imposing list of members and its table of organization, the new society held great promise for American neurology. Its 57 active members included the foremost men in New York, among them in addition to the officers Edward Janeway, William Draper, Abraham Jacobi, Charles Bull, Lewis Sayre, and Edward Seguin. Among its corresponding members were the illustrious of London, Paris, and Berlin.

It is of interest to compare the membership rolls of the two societies.

NEW YORK SOCIETY OF NEUROLOGY AND ELECTROLOGY

Resident Members

W. P. Ackerman	R. H. Derby	Edward G. Loring, Jr.
J. W. S. Arnold	John H. Douglas	William T. Lusk
Fordyce Barker	W. H. Draper	John J. Mason
George M. Beard	Nathaniel B. Emerson	T. H. McBride
Albert Buck	H. P. Farnham	John Moore, U.S.A.
Lucius D. Bulkley	Austin Flint, Jr.	A. P. Meylert
Charles S. Bull	John W. S. Gouley	Robert Newman
John Byrne	*A. McL. Hamilton	*H. D. Nicoll
Alfred L. Carroll	George G. Hopkins	H. D. Noyes
Clement Cleveland	James B. Hunter	James J. O'Dea
Meredith Clymer	Abraham Jacobi	*C. Inslee Pardee
J. G. Curtis	Edward G. Janeway, Jr.	*Ralph L. Parsons
John C. Dalton	Frank P. Kinnicutt	John G. Perry

Charles T. Poore	Samuel Sexton	*R. W. Taylor
Beverly Robinson	Gouverneur M. Smith	J. Van Bibber
A D. Rockwell	H. J. Stirling	S. Oakley Van Der Poel
*D. B. St. John Roosa	F. R. Sturgis	*Charles T. Whybrew
Lewis A. Sayre	Gilbert H. Sweezy	Charles Wright
Edward Seguin	J. Theus Taylor	Leroy M. Yale

* Member of both Societies.

Honorary Members: C. E. Bernard, Paris; J. M. Charcot, Paris; J. Lockhart Clarke, London; F. C. Donders, Utrecht; H. Helmholtz, Berlin; C. Westphal, Berlin.

Corresponding Members: T. Clifford Allbutt, Leeds; Julius Althaus, London; Roberts Bartholow, Cincinnati, Ohio; Charlton Bastian, London; J. Keating Bauduy, St. Louis, Mo.; J. Warburton Begbie, Edinburgh; Moriz Benedikt, Vienna; Charles Bouchard, Paris; Désiré Magloire, Bourneville, Paris; H. P. Bowditch, Boston; Rudolf Brenner, St. Petersburg; W. H. Broadbent, London; J. Crichton Brown, Wakefield, England; John Charles Bucknill, Rugby, England; J. L. Cabell, University of Virginia, Va.; W. B. Carpenter, London; John B. Chapin, Willard, N.Y.; George Clymer, Washington, D.C.; J. Solis Cohen, Philadelphia; W. J. Conklin, Dayton, Ohio; George Cook, Canandaigua, N.Y.; E. Cyon, St. Petersburg; Emil Dubois-Reymond, Berlin; G. B. Duchenne, Paris; Legrand Du Saule, Paris; Pliny Earle, Northampton, Mass.; Robert T. Edes, Boston; W. Erb, Heidelberg; Albert Eulenberg, Berlin; David Ferrier, London; Eduard Fournier, Paris; N. Friedreich, Heidelberg; Carl Frommhold, Prague; William Tennant Gairdner, Glasgow; John P. Gray, Utica, N.Y.; Sir William Gull, Bart., London; G. Heyem, Paris; Eduard Hitzig, Berlin; Edward R. Hun, Jr., Albany, N.Y.; Hughlings Jackson, London; John D. Jackson, Danville, Ky.; J. S. Jewell, Chicago; C. Handfield Jones, London; A. D. Kellogg, Poughkeepsie, N.Y.; Axel Key, Stockholm; Thomas L. Kirkbride, Philadelphia; Thomas Laycock, Edinburgh; F. D. Lente, Saratoga Springs, N.Y.; D. F. Lincoln, Boston; J. Luys, Paris; W. H. Mason, Buffalo, N.Y.; H. W. Maudsley, London; Moritz Meyer, Berlin; Theodor Meynert, Vienna; S. Weir Mitchell, Philadelphia; Julius Nicolaysen, Christiana, Norway; John W. Ogle, London; E. Onimus, Paris; William Pepper, Philadelphia; E. F. W. Pflüger, Bonn; James J. Putnam, Boston; Charles Bland Radcliffe, London; J. Spence Ramskill, London; Isaac Ray, Philadelphia; J. Russell Reynolds, London; William Roberts, Manchester; J. Rosenthal, Erlangen, Bavaria; N. Rosenthal, Vienna; W. Rutherford Sanders, Edinburgh, W. H. Octavius Sankey, Cheltenham, England; Moritz Schiff, Florence, Italy; Herbert Tibbets, London; A. Tripier, Paris; Daniel Hack Tuke, Falmouth, England; Thomas Harrington Tuke, London; J. Batty Tuke, Edinburgh; Rudolf Virchow, Berlin; A. Vulpian, Paris; S. G. Webber, Boston; W. C. Wey, Elmira, N.Y.; Samuel Wilks, London; J. Janvier Woodward, Washington, D.C.

NEW YORK NEUROLOGICAL SOCIETY

Officers: President, William A. Hammond, M.D.; First Vice-President, J. C. Peters, M.D.; Second Vice-President, J. Marion Sims, M.D.; Recording Secretary, George W. Wells, M.D.; Corresponding Secretary, Max Herzog, M.D.; Treasurer, Alexander Murray, M.D.

Councillors: J. H. H. Burge, M.D.; D. B. St. John Roosa, M.D.; T. M. B. Cross, M.D.; F. D. Lente, M.D.; F. LeRoy Satterlee, M.D.

FIG. 1.

FIG 2.

FIG. 3.

FIG. 1. George M. Beard, 1837-1883, Professor of Nervous and Mental Diseases, New York Medical College.

FIG. 2. John C. Dalton, 1823-1889, Professor of Physiology; President, College of Physicians and Surgeons, Columbia University, 1884-1888.

FIG. 3. Austin Flint, Jr., 1836-1915. A founder of Bellevue Medical College and its first Professor of Physiology.

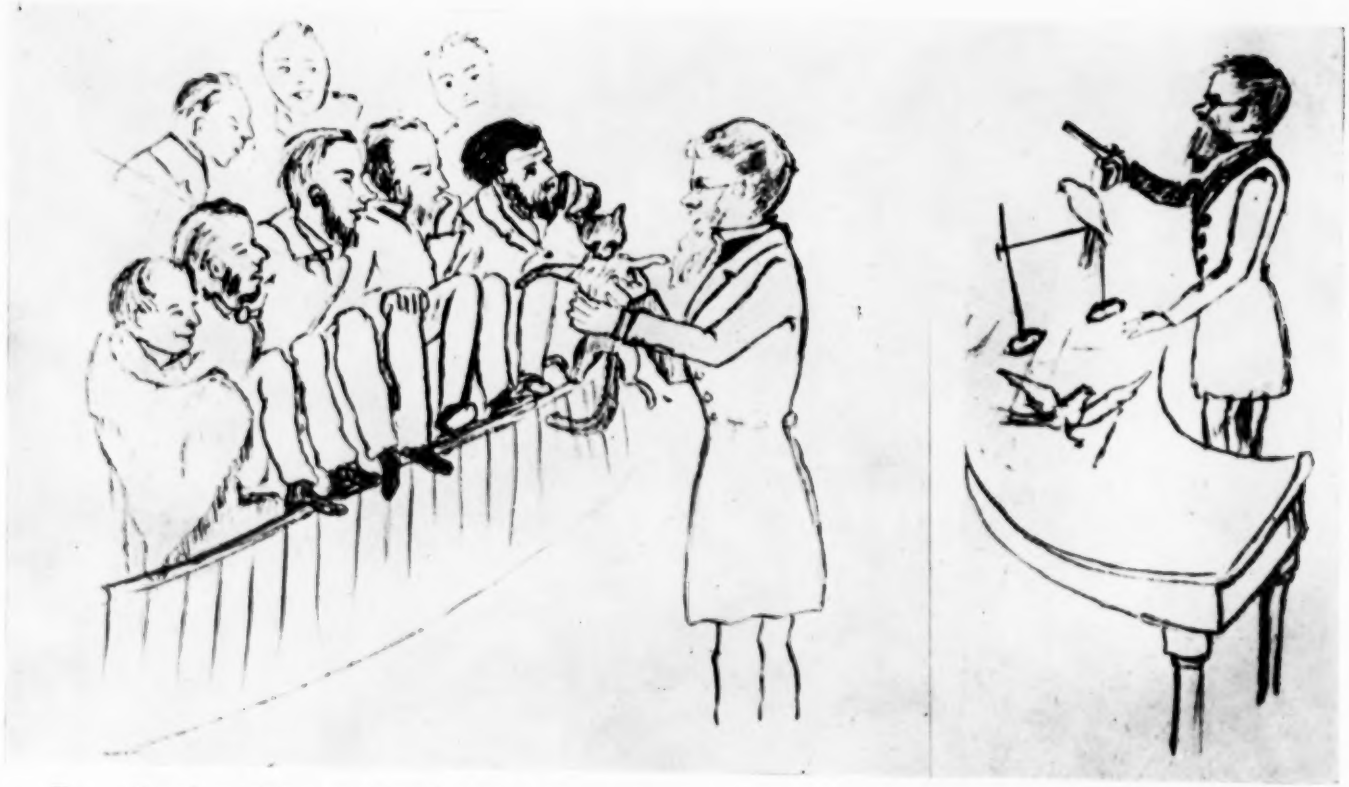

FIG. 4. Sketch made by students during Professor Dalton's lectures on physiology. (Courtesy of Dr. John Shrady, The College of Physicians and Surgeons, New York. Lewis Publishing Co., 1903.)

A. "Gentlemen see for yourself." Sympathetic ganglia removed:contracted pupil, congested tissues, increased sweating and elevated temperature.

B. (1) Pigeon with cerebral hemispheres removed. Pigeon opens its eyes which shows it hears pistol, but takes no cognizance of the noise, stupidly keeps to the perch. (2) Pigeon with cerebellar hemispheres removed. Pigeon fluttering trying to escape, conscious of danger, but has no command over equilibrium.

Active Members

Morris J. Asch	William A. Hammond	*R. L. Parsons
Thomas S. Bahan	C. E. Harwood	George A. Peters
J. W. Barstow	M. H. Henry	J. C. Peters
Leon De Bremon	Max Herzog	Seneca D. Powell
J. H. H. Burge	F. E. Hutchinson	F. H. Rankin
I. Green Cardner	W. A. James	Stephen Rogers
T. Edwards Clarke	John T. Kennedy	*D. B. St. John Roosa
S. G. Cook	F. B. Lawson	F. LeRoy Satterlee
P. W. Cremin	C. A. Leale	Harry M. Sims
T. M. B. Cross	F. D. Lente	J. Marion Sims
Joseph E. Culver	John Lynch	F. G. Snelling
Albert A. Davis	E. A. Macdonald	*R. W. Taylor
B. F. Dawson	John D. McGill	T. R. Varick
Alexander N. Dougherty	M. A. Miller	Clinton Wagner
Edward Frankel	Alexander Murray	H. Wakeman
C. E. Hackley	W. T. Nealis	B. A. Watson
*A. McLane Hamilton	*H. D. Nicoll	G. W. Wells
Frank H. Hamilton	*Ch. Inslee Pardee	*C. T. Whybrew

*Member of both Societies.

Honorary Members: John W. Ogle, London; B. W. Richardson, London; G. Fielding Blandford, London; T. Clifford Allbutt, Leeds; S. Weir Mitchell, Philadelphia; Alfred Stillé, Philadelphia; Roberts Bartholow, Cincinnati, O.; Edward R. Hun, Albany, N.Y.; Edward H. Clarke, Boston, Mass.; William Thompson, Philadelphia; Hughlings Jackson, London; Labbadie Lagrave, Paris; D. F. Lincoln, Boston, Mass.; A. Brière de Boismont, Paris; J. Baillarger, Paris; G. B. Duchenne de Boulogne, Paris; Albert Eulenberg, Berlin, Prussia; C. Westphal, Berlin, Prussia; Thomas Laycock, Edinburgh; F. E. Anstie, London; J. Russell Reynolds, London; Henry Maudsley, London; H. Charlton Bastian, London; J. Crichton Brown, Leeds; J. S. Jewell, Chicago; Isaac Ray, Philadelphia.

The New York Society of Neurology and Electrology, as may be seen, initially had a larger and more distinguished membership than the New York Neurological Society. Eleven of its members were among the 35 founders of the American Neurological Association, whereas only five founders belonged to the New York Neurological Society.

An interesting feature of the New York Society of Neurology and Electrology was the scientific standing committees to which difficult and unusual cases were assigned for diagnosis and further study. These committees were: Anatomy and Histology of the Nervous System—J. W. S. Arnold, Edward Janeway, Edward Seguin; Physiology and Pathology of the Nervous System—John C. Dalton, D. B. St. John Roosa, Edward G. Loring; Therapeutics of the Nervous System—Austin Flint, Jr., William T. Lusk, William H. Draper; Psychology—Meredith Clymer, Ralph L. Parsons, John O'Dea; Electro-Physics and Electro-Physiology—John J. Mason,

Alfred L. Carroll, G. Van Bibber; Electro-Theraputics—George M. Beard, A. D. Rockwell; Curator, Edward Seguin.

In spite of the change in name, the use of electricity as a therapeutic measure remained the prime interest for a few of the members of the original Electro-Therapeutic Society. Beard and Rockwell had manifested an interest in electro-therapeutics in 1866 and in 1872 published their work on *The Medical and Surgical Uses of Electricity*. This volume was widely accepted and translated into German. Interest in electro-therapeutics was not limited to this society, however, for at the first meeting of the American Neurological Association, 2 June, 1875, Dr. Rockwell presented a paper entitled 'A Survey of the Field of Electro-Medicine, with Special Reference to its Physiological and Therapeutic Relations to the Nervous System.'

In the early 1870's electricity had an especial appeal for the neurologist in view of the experimental work of Fritsch, Hitzig, and Ferrier on cerebral localization. Four members of the newly formed society held chairs of physiology—John Call Dalton in the College of Physicians and Surgeons; Austin Flint, Jr., in Bellevue Hospital Medical School; J. W. S. Arnold, in New York University Medical School; John Mason in the University of the City of New York—and were especially interested in experimental research on the physiology of the brain.

The first stated meeting* of the new organization took place 21 January, 1874, with an inaugural address by the President, Meredith Clymer, on 'Current Topics in Neurology—A Review of the Work of Fritsch, Hitzig, and Ferrier.' At this meeting Gilbert Sweezey presented a boy aged nine who went to bed Christmas night 1873 and on awakening found he had lost the faculty of speech. No diagnosis had been made by Dr. Sweezey, and after some discussion Dr. Seguin moved that the patient be referred to the Committee on Physiology and Pathology for further study. A similar procedure was followed with other difficult diagnostic problems.

On 20 March, 1876, Dr. Janeway read a paper on 'Symptomatology and Diagnosis of Brain Tumors—Nine Cases,' which became a symposium on brain tumors. Bull reported a case with exophthalmos, pain and ptosis of the left eyelid, shown at autopsy to be due to a large tumor invading the orbit (probably a men-

* The meetings were reported in the *New York Medical Journal* in 1874 and 1875 and in the *American Psychological and Medico-Legal Journal* in 1875 and 1876, but the papers and cases presented were not printed.

ingioma), and Gibney referred to two cases of brain tumor, one of which involved the pons. There followed considerable discussion by Drs. Bull, Noyes, Cross, and Dalton as to the value of optic neuritis in the diagnosis, and of the degree of the optic decussation —whether it was complete or incomplete. Since no clear-cut decision was reached as to the criteria essential for the diagnosis of brain tumors, Dr. Janeway moved that the problem be referred to a committee for further study.

Among other patients presented before the Society were two of Van Bibber with facial paralysis. Kinnicut demonstrated an apparatus for the treatment of facial paralysis using a silver wire to slip over the ear and into the buccal cavity. Janeway reported the autopsy findings on two patients with detachment of the odontoid process and sudden death, one on sneezing and the other on yawning. Among other presentations were: A. McLane Hamilton's 'A New Dynometer'; Van Bibber's 'A Case of Morphia Habit—730 grs. of Opium in Twenty-Four Hours'; Sayre's 'A Case of Reflex Action of the Lower Extremity, the Result of Injury to the Plantar Fascia'; Draper's 'A Case of Partial Facial Atrophy.' This last case brought forth a lengthy discussion concerning the existence of trophic nerve centers, which both Flint and Dalton questioned.

Seguin presented sections of the spinal cord in infantile paralysis, showing three different specimens of cells. Papers were read by Austin Flint, Jr., on 'The Mechanism of the Reflex Nervous Action in Normal Respiration'; by Dalton on 'The Transmission of Motor and Sensitive Nervous Action'; by Bulkley on 'The Relation of the Nervous System to Diseases of the Skin'; by Loring on 'The Circulation of the Retina and Its Relation to That of the Brain.' Dr. Dupuy, a pupil of Brown-Séquard, and an opponent of the theories of Ferrier, discussed 'The Physiology of the Cerebral Hemisphere,' using for demonstration two small dogs and two guinea pigs from which the cerebral cortex had previously been removed. Dupuy attempted to disprove the doctrine of cerebral localized functional centers and this brought forth dissenting views from both John Dalton and Austin Flint, Jr. A special committee consisting of J.C. Dalton, J. W. S. Arnold, G. M. Beard, Austin Flint, Jr., and J. J. Mason, presented a lengthy report on 'Experimental Researches on the Motorial Functions of the Cerebral Convolutions; Their Existence and Localization.' H. P. Bowditch and James Putnam came from Boston to discuss this paper. Two im-

portant papers were presented by Seguin, one on 'Hysterical Symptoms in Organic Diseases of the Nervous System' and the other on 'Pathological Specimens of Diffuse Sclerosis of the Cerebrum and Spinal Cord.' The latter was the first case in this country of multiple sclerosis verified by post-mortem examination. Roosa presented a 'Contribution to the Etiology of Diseases of the Internal Ear; D. F. Lincoln, a corresponding member from Boston, read a paper which interested a large number of members on 'The Resistance of the Body to Electric Force.'

Thus the programs were broad in scope, with clinical, pathological, and physiological material of interest to neurologists. Neurology at this period had only begun as a specialty. The first journal in America devoted to the nervous system was the *Journal of Nervous and Mental Diseases*, which began publication in 1874, and the first American textbook was Hammond's *Treatise on Diseases of the Nervous System*, which appeared in 1871.

A few words may here be appropriate concerning some of those who in large measure determined the character of the Society. John C. Dalton was Professor of Physiology at the College of Physicians and Surgeons and as its tenth President was responsible for raising the money to move the College from 23d Street to 59th Street. He brought about the first academic recognition in America of physiology as a separate chair and held the first full-time professorship in any medical school in the United States. It is of interest in this connection that the University Council of Great Britain in 1868 refused to recognize the Harvard medical degree because that school had no professor of physiology. Henry P. Bowditch was later appointed assistant professor of physiology (1871) with the concurrence of Holmes who held the chair of anatomy and physiology. Weir Mitchell considered Dalton's *Topography of the Brain* outstanding, saying "I know of no other anatomy of the brain so satisfactory for reference." Dalton's *Textbook on Physiology*, published in 1859, was also warmly received, going through a number of editions. Both Princeton and Columbia conferred on him the honorary degree of Doctor of Laws.

Austin Flint, Jr., one of the founders of Bellevue Medical College, held the chair of physiology and served as Secretary and Treasurer of the college. His graduation thesis at Jefferson Medical School in 1857 on 'The Phenomena of the Capillary Circulation' was published in the *American Journal of the Medical Sciences*. The first volume of a five-volume work on *Physiology of*

Man appeared in 1866 and this was later "condensed" into *A Textbook of Human Physiology* of nearly a thousand pages, designed for students and practitioners. In 1869 in the *Journal of Psychological Medicine* Flint presented a detailed review of the motor and sensory functions of the nerves. Over the years he became increasingly interested in diseases of the nervous system, serving from 1898 to 1906 as consulting physician for the Manhattan State Hospital for the Insane and playing an active role as alienist for the State in the Thaw case.

In the clinical field, William Draper and Edward Janeway were equally influential in guiding the destinies of the society. Draper was Professor of Clinical Medicine and attending physician at the New York and Roosevelt Hospitals and a trustee of the College of Physicians and Surgeons. Osler said of him, "We listened to no one with greater attention, and the youngest among us looked on him as in all respects the ideal physician. . . . It has been given to few men to adorn the profession with greater graces of the head and of the heart."

Janeway, Professor of Practice at Bellevue Hospital Medical School, laid the foundation for his eminence as a great physician in a six-year study of pathological material at Bellevue, published in 1870 as *Pathological Reports and Autopsies*. He was for many years visiting physician to Bellevue Hospital. Both Rutgers and Columbia conferred on him an honorary degree of Doctor of Laws.

When to these men we add Abraham Jacobi, who lectured on pediatrics at the College of Physicians and Surgeons and established pediatrics as a specialty in America, and Edward Seguin, Professor of Nervous Diseases at the College of Physicians and Surgeons, considered by Mills to be the foremost neurologist in America, it becomes obvious that a more distinguished group could not have been brought together. Each had attained eminence in his respective field prior to the foundation of the New York Society of Neurology and Electrology and brought to it great prestige.

At the annual meeting on 20 December, 1875, the Society changed its name to the New York Society of Neurology, thereby compounding the already existing confusion as to the identity of the two neurological groups. The Society continued as an active organization, holding monthly meetings at the College of Physicians and Surgeons until late 1876. The officers for this latter year were: President, D. B. St. John Roosa; Vice-President, William H.

Draper; Recording Secretary, Alfred L. Carroll; Secretary and Treasurer, Allan McLane Hamilton; Curator, Edward Janeway; members of the Executive Council, John C. Dalton, Austin Flint, Jr., H. D. Noyes, and John J. Mason.

Regrettably no record of the final meetings has been found. All we know is that in 1877 the Society is listed as no longer in existence. What transpired remains a mystery. We do know that at a meeting of the Council of the New York Neurological Society, 29 March, 1877, a letter was read from E. C. Seguin on behalf of the New York Society of Neurology suggesting that the two societies now organized for the promotion of neurological studies appoint committees to consider the expediency of a union and the basis thereof.

Apparently full agreement was reached, for at a subsequent meeting of the Council of the New York Neurological Society it was recommended that the following circular be sent to each member of the *late* New York Society of Neurology:

My dear Doctor - - - - -:

In view of the fact that the New York Neurological Society is at present the only society in the city of New York devoted to the cultivation of the neurological sciences in active operation, Resolved, that members of the New York Society of Neurology be invited to unite themselves with this association and that for such members the initiation fee of $5.00 be remitted. Annual dues of $2.00 only will be charged.

New York Neurological Society
GEORGE WELLS, Secretary

At this same meeting of the Council of the New York Neurological Society, 12 members of the New York Society of Neurology were proposed for election to the New York Neurological Society, viz: E. C. Seguin, George M. Beard, L. D. Bulkley, A. Jacobi, Mary Putnam Jacobi, B. Robinson, A. D. Rockwell, L. A. Sayre, L. Hall Sayre, C. S. Bull, R. J. O'Sullivan, and R. D. Lincoln.

The resolution of the Council was then brought before the annual meeting of the New York Neurological Society on 2 April, 1877, where it was unanimously resolved "that these members of the New York Society of Neurology be invited to unite themselves with the New York Neurological Society."

At this meeting, although Seguin had just been made a member of the New York Neurological Society, he was elected President and a member of the Council—a most gracious gesture to the newly elected members of the former rival society. On 2 June, 1877, a special meeting of the Council of the New York Neuro-

logical Society was called by Dr. Seguin at his office, 41 West 20th Street, to propose for membership three additional members of the New York Society of Neurology, Dr. R. W. Taylor, Dr. F. P. Kinnicut, and Dr. N. B. Emerson. It was then voted to receive these men as members without initiation fee, in accordance with the resolution of the April 2d meeting. Thus within two months 15 members of the New York Society of Neurology became members of the New York Neurological Society.

The fact that two societies devoted to diseases of the nervous system could exist simultaneously in New York City when neurology was only beginning to be recognized as a specialty bespeaks the great interest in that field and explains the pre-eminence of New York City as the foremost neurological center in the Western Hemisphere. Of the 42 founders of the American Neurological Association, 16 came from New York, 5 from Boston, and 3 from Philadelphia.

The rather sudden disappearance of the New York Society of Neurology, counting among its members the great men in New York medicine, is intriguing. In the absence of definite information, our only recourse is to try to interpret the few leads available. For the Society to have had the benefit of the critical opinion of four professors of physiology in interpreting the new experimental work on cerebral localization and the problems arising in the advancing study of neurophysiology must surely have been of great help. On the other hand, Dalton's paper, 2 February, 1876, on 'Curious Optical Illusions Demonstrated by Rapidly Revolving Discs', Austin Flint's paper 17 April, 1876, on 'Auditory Accommodation—the Physics of Sound—Musical and Noise,' and Dupuy's report, 30 October, 1876, on 'The Effect of Electric Current on the Exposed Frog Nerve', as well as one or two other physiological papers, may not have appealed to those interested in the emerging field of clinical neurology. In general, however, the papers were clinical and must have evoked the interest of all the members. It is difficult to believe that too great stress was laid on neurophysiological problems for, after all, neurophysiology has always been the leaven in neurology.

It seems more probable that the Society came to an end as a result of a fundamental clash of two dominant personalities and disagreement concerning the inclusion of insane asylum superintendents as members of a neurological society. When McLane Hamilton, the Secretary-Treasurer, assumed the editorship of the

Psychological and Medico-Legal Journal upon William Hammond's resignation, the title of the journal was changed to the *American Psychological and Medico-Legal Journal* and it was published quarterly instead of monthly. In the first issue under his aegis, November 1875, Hamilton commented caustically in an editorial upon the resolution introduced at the first meeting of the American Neurological Association excluding superintendents of insane asylums from membership. This step had been taken by the Association since its membership was then limited to 50, and especially since the superintendents of insane asylums already had their own *exclusive* organization. Hamilton objected to the resolution, particularly as its author and several other members of the American Neurological Association "were connected in some way with asylums." (The resolution was probably proposed by William Hammond, founder of the American Neurological Association and the New York Neurological Society.)

Continuing his opposition to this resolution, Hamilton, in the next issue of his journal, February 1876, informed its readers that the journal henceforth would represent the interests of the insane asylums of America as well as constitute the official organ of the New York Society of Neurology and that its title would henceforth be *The American Psychological Journal.* Hamilton had high praise for a paper in this issue by Dr. A. E. Macdonald "whose well known reputation as the executive medical officer of Ward's Island Insane Asylum is enough to encourage us in looking for much information" and he quoted at length in his editorial from Macdonald's article.

In the May 1876 issue Hamilton announced that Dr. Macdonald had been made associate editor and would devote his entire attention to the problems of lunatic asylums. Macdonald's paper on 'Feigned Insanity' was the leading article in this issue. Articles announced for publication in 1876 included one by Dr. John P. Gray of the New York State Asylum at Utica, another by Dr. James Maclaren of the Royal Asylum, Edinburgh, and one by Dr. Bauduy of St. Louis on the insane.

A critical and carping eight-page review of the sixth edition of Hammond's *Treatise on Diseases of the Nervous System* was begun in this number, to be continued in the next—few book reviews have been accorded as much space. A scathing editorial by Hamilton finding fault with Hammond and Mott for their public exposure of spiritualism also appeared in this issue.

Both Austin Flint, Jr., and McLane Hamilton prided themselves on being alienists. Hamilton boasted in his memoirs of some of the cases in which he had served as an expert. The exclusion of asylum superintendents from the American Neurological Association aroused him to champion their cause, and their inclusion in the New York Society of Neurology may have resulted in a fundamental disagreement.

We do know that the *Psychological Journal*, after having informed its readers that henceforth it would represent the interests of the insane asylums and would be the official organ of the New York Society of Neurology, ceased publication and at about the same time that Society also went out of existence. Whatever the reason, no organization could have begun with greater talent than the New York Society of Neurology nor embodied greater expectations.

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Phenylketonuria (Fölling's Disease)*

The Story of Its Discovery

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A little over 25 years ago, phenylketonuria was unknown. Today, because of the successful treatment of this disease, there are normal children who will soon be entering school in spite of their basic metabolic disturbance. In between is the story of many workers in the field of medicine and biochemistry. Probably the most dramatic part of this history, however, is the story of the discovery of the disease in 1934.

This is the story of a persistent, observant Norwegian mother with two handicapped children, and of a Norwegian doctor (Fig. 1) with an unusual degree of insight and ability. Mrs. E. was an attractive, intelligent, young woman whose two children were discovered at an early age to be mentally retarded. The first child, a little girl, was noted at one year to be slow in her development. She did not walk until she was almost two and never learned to say more than a few words. Also, from early infancy the parents had noticed a peculiar odor which clung to her despite frequent bathing. Three years after the birth of the first child, a little boy was born. The baby seemed alert at first, but in a few months he began to lose interest in his surroundings. Despite the efforts of his mother, he developed very slowly thereafter and seemed to be withdrawn. He never learned to walk or talk. It was also remarkable to the family that this boy had the same musty odor as had his sister. In her plight, Mr. E. sought medical advice. When there seemed to be no explanation for the retardation of her children, she went hopefully from doctor to doctor. The children were seen by three child specialists, and the little boy was admitted to the

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Children's Hospital in Oslo for a complete examination. The failure of recognized medical authorities to help her children was a great disappointment to this tremendously concerned and persistent young mother. She felt that there should be some explanation as to why both her children were so affected. In desperation, she turned to healers of more uncertain calling, only to be disappointed time and time again.

The matter of the peculiar and clinging odor of both the children was distressing also. The father, a busy dentist afflicted with severe asthma, claimed that he could not stay in a closed room with the children because of their odor. He discussed his perplexing problem with a colleague, mentioning particularly the odor which seemed to be associated with the urine of the children. The colleague suggested getting in touch with Dr. Fölling, with whom they had both been acquainted in dental school and who, with his biochemical knowledge, might be able to find out at least what was causing the odor. Thus, in the spring of 1934 at the ages of four and seven years, the children were taken to Dr. Asbjorn Fölling.

Dr. Fölling had worked hard for his medical education. He had first obtained a degree in biochemistry. While working in biochemistry, he took every opportunity to study medicine on the side. Even so, he went through most of his medical courses in record time. He wrote his medical thesis on "Mechanisms of Acidosis" and in 1932 became Professor in Nutritional Research at the University of Oslo School of Medicine. When these children were brought to him in 1934, the active interest and the careful research which he applied to the problem of two retarded siblings with a peculiar urinary odor brings to mind the sharp profile of a man with both knowledge and dedication to science.

Dr. Fölling first investigated the urine of these children for a possible chronic infection. When there was no evidence of infection, he decided to test for diacetic acid, adding 10 per cent ferric chloride to see if he would get a red-brown color. To his surprise, a green color appeared. He wondered if this could be the result of some medicine the children had been given. He asked the mother to bring additional urine specimens, making certain that no drugs or medicines were taken beforehand. The urine again turned green with ferric chloride. He remembered that adrenalin gives a similar green color with ferric chloride, but tests showed no evidence of

adrenalin or similar substance in the urine. He was intrigued by this problem and he set out to identify this unknown substance in the urine. He was already wondering, of course, if this unusual finding were not in some way connected with the children's mental deficiency.

"So, I had the mother collect 20 liters of urine for me to work with," Dr. Fölling recalls. He then started relentlessly to track down the illusive substance. He followed through extractions and chemical separations. "I always knew where it was," says Dr. Fölling, "because it would give the green color with ferric chloride." It took him a week to devise a means of extraction; then it took one month to get a pure compound and six weeks to identify it. His efforts to obtain a pure crystalline product were complicated because the substance was immediately oxidized in the air, leaving only a dark spot in his test tube. Thereafter, he had to work in a nitrogen atmosphere; and finally, after many recrystallizations, he obtained a pure product.

The combustion (or elementary) analysis and molecular weight of the pure product corresponded with the formula $C_9H_8O_3$. Earlier he had noted that when the impure unidentified substance stood for a few days in the air, the odor of benzaldehyde (C_6H_5CHO) came off. Dr. Fölling reasoned that this was probably an oxidation product. When gently heated with potassium permanganate in alkaline solution, oxalic acid ($\begin{matrix}COOH\\COOH\end{matrix}$) and benzoic acid ($C_6H_5COOH$) were obtained. Dr. Fölling then postulated that the most likely formula was $C_6H_5CH_2CO\ COOH$ (phenylpyruvic acid). He proved that phenylpyruvic acid and the unknown substance were the same by synthesizing phenylpyruvic acid and determining that they both had the some properties.

He hypothesized that this disease represented a disturbance in the metabolism of the amino acid, phenylalanine ($C_6H_5CH_2CHNH_2COOH$), and that this same abnormality might be causing the retardation in these two children and perhaps in other mental defectives. A survey of several hundred patients in a large nursing home and a local school for the retarded led to the discovery of eight more cases within a short time (including two more sibling pairs). The affected siblings were found when the families of the patients discovered in the institutions were tested.

FIG. 1. Dr. Asbjörn Fölling (1888-), biochemist and physician. Photograph taken shortly after his discovery of phenylketonuria in 1934.

In the space of five months after Mrs. E. brought her children to him, Dr. Fölling had ready for publication a scholarly report on a new metabolic disease which he had identified in ten cases. He postulated that it was an inherited disorder of phenylalanine metabolism and he called it "imbecillitas phenylpyrouvica."[1,2]

Dr. Fölling realized, of course, that he had barely touched the surface of the interesting disease which he had discovered and he was eager to learn more. Interestingly enough, he started by trying to identify the carrier state by means of phenylalanine tolerance tests similar to those which have recently been successfully done and reported in the United States. The first difficulty he had was in obtaining some phenylalanine. He finally procured some DL phenylalanine from a pharmaceutical company in Germany, which he paid for himself, 12 crowns ($2.00) per gram. He gave some to a mother of one of these patients, to himself, and to a cooperative friend. Quite unexpectedly, he found that they all gave a green test for phenylpyruvic acid in the urine. He wondered if they were all carriers. Next, he tried some on rats and dogs, and their urines also turned green with ferric chloride. He later realized that the d-form, not being a natural metabolite, always forms phenylpyruvic acid. It was several more years before Dr. Fölling obtained some pure l-phenylalanine to continue his work. This was in 1938.

If Dr. Fölling had done nothing except discover the disease phenylketonuria, his contribution to the field of metabolic diseases would have been unusual and his position in the history of mental deficiency unique. But his contribution did not stop there. He has continued to be one of the most significant contributors to the understanding of this disease—including, in collaboration with his Norwegian colleagues, such other accomplishments as being the first to devise a method of measuring serum phenylalanine levels and thus the first to prove that these levels are high in phenylketonurics, also the first to demonstrate the increased urinary excretion of certain other metabolites such as phenyllactic acid and phenylalanine.[3]

Interest in this disease spread rapidly to research workers of many countries. By the efforts of scores of investigators over the past quarter century, step by step its mysteries are being unraveled. And still the research goes on, for many facts about phenylketonuria are still unknown.

The first positive urine test for phenylketonuria was an accidental discovery. But for the skill and imagination with which Dr. Fölling followed this lead, the opportunity would have passed quietly into oblivion. Instead, he discovered a disease which has challenged the imagination of many scientists who are now leading the attack on this and other degenerative diseases.

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Jean-Martin Charcot and The History of Experimental Hypnosis

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TOMLINSON and Haymaker,[12] in an article on Charcot based on a biography by Georges Guillain,[5] quoted Guillain on Charcot and hypnosis as follows: "He never personally hypnotized a single patient, never supervised a seance and, consequently, was not in a position to evaluate the procedure." For reasons that will soon be explained I examined the original biography with special attention to the chapter on hypnosis. The passage just noted reads: "Charcot n'a jamais hypnotisé personnellement un seul malade, n'a jamais exercé une surveillance sur les expériences et, par conséquent, n'a pu critiquer leurs insuffisances et leurs causes d'erreurs éventuelles." Later, when it appeared, I read the English translation by Pearce Bailey[5] of Guillain's careful study of the great neurologist. Here we find: "Charcot personally never hypnotized a single patient, never checked the experiments and, as a result, was not aware of their inadequacies or of the reasons of their eventual errors." Minor differences in translations are not important to the points of view I wish to present. They will be based on the text as translated by Bailey, since he tells us in his preface that Guillain read the manuscript twice and offered useful suggestions.

It seems doubtful that the failure of Charcot's work with hypnosis to stand the test of time is based entirely on the allegations above. I question whether the statement can be accepted at face value. Guillain conscientiously pursued the possibility of multiple causes of failure. He mentioned the spectacular, even theatrical, aspects of Charcot's clinics on hysteria and hypnotism, indicating that for these he had been "justly criticized." These, I should say, could affect attitudes toward the subject but would not affect the intrinsic validity of the underlying scientific observations. Guillain also turned his attention to Charcot's pupils and assistants. He claimed that Charcot did not participate with his chiefs of clinics, interns, and other assistants in the preliminary preparation of patients so that he accepted from his assistants what he was told.

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He mentions further that some students were on hand at hypnosis sessions when they had no business there, and that they even suggested some experiments, all of which I believe may have influenced the atmosphere at the time but are of questionable significance as far as the interpretation of findings is concerned. I believe this point is reënforced by Guillain's own estimation of Charcot's assistants as men of good scientific character, intelligence, and moral integrity.

Did Charcot ever personally hypnotize a patient? When it is said he did not, we can accept that his biographer regarded it as an established truth. Certainly it is a point that can be regarded as possible if not probable. For fully rounded scientific experience with hypnosis, such participation is unquestionably desirable, but it would be a mistake to conclude that the lack of such personal participation excludes ability to arrive at meaningful scientific conclusions if additional rich experience is gained in hypnosis studies. The exaggerated emphasis on hypnotic induction procedure continues even today. Yet regarding induction, is it implied that Charcot not only failed to participate in preparatory inductions, but had no hand in subsequent inductions? This is rather improbable because he was a participant in demonstrations when re-inductions must have been an integral part of the clinics. As for not checking experiments, one may wonder what phase of their development is implied, and what is meant by "checking." Certainly he had direct contact in observing them at various times, contact with the patients, and he participated in evaluations of them and discussions about them.

I should like to quote the first paragraph of the preface to *Le Magnétisme Animal*,[1] a book issued in English translation in 1888. The paragraph reads:

> We think it well to state that this work was written in the environment of the Salpêtrière. By this we not only mean that our descriptions apply to facts observed in that hospital, but also that our personal observations were made in accordance with the method inaugurated by M. Charcot, the chief of the school of the Salpêtrière, that is, in accordance with the experimental method which is illustrated by clinical science. While relying on the observation of spontaneous facts, we have strengthened these facts by experiments.

On page 88 of this book we find comments on induction which raise a question about the possible participation of Charcot but unfortunately do not supply a clear answer:

Sensorial excitements produce hypnosis in two ways: when they are strong and abrupt, or when they are faint and continued for a prolonged period.

The former mode of excitement was studied for the first time by Charcot and his pupils, who employed, among other means, vivid impressions on the sight, such as the sudden introduction of a solar lamp into a dark room, fixing the eyes on the sun, the incandescence of a strip of magnesium, the electric light, etc. In hysterical subjects the intense excitement immediately produces catalepsy.

Also, the following on page 199 appears to be an indication of participation in procedure, but may have been only a gesture to his role as director: "Charcot and his pupils at the Salpêtrière have often produced the effects of burns upon the skin of hypnotized subjects by means of suggestion."

Can the next statement, however, be ignored in any argument regarding Charcot's actual personal involvement in an hypnotic experimental role?

Charcot has often repeated a curious experiment which fundamentally resembles the foregoing one. It is suggested to the subject that there is a portrait on a blank card, which is then mixed with a dozen others which appear to be precisely similar. The subject is requested, on awakening, to run his eye over these cards, which he does without understanding the reason, but when he comes to the card on which the imaginary portrait was traced he sees it at once.

All these experiments seem to imply that the hallucinatory image produced in the subject by verbal suggestion does not remain in his brain a vague and floating state; it is probable, as one of the present writers has shown, that this image is associated with some external mark—a dot, for instance, or a raised spot,—some distinctive feature of the blank card which was shown to him when the suggestion was made, and this association of the cerebral image with an external mark would explain the series of facts of which we have given an account (pages 225-226).

Further, is not the following an indication of Charcot's significant personal activity? After describing an hypnotic experiment on hallucinatory color phenomena and after images, the authors write:

This experiment was repeated by Charcot before a numerous assembly, during one of his lectures on aphasia. That eminent professor demonstrated that, in order to ensure success, care must be taken to define the nature of the suggested colour. For instance, if only the colour *red* is suggested, the subject may either see the shade of red, of which green is the complementary colour, or the orange-red, of which blue is complementary. These contradictory results are impossible when the colour which the subject is intending to see is made clear by a comparison (pages 253-254).

I may add that similar hypnotic experiments have been done in more recent years, with continuing differences of opinion over the results. Also, they state (page 284): "It may be profitable to

consider the facts of automatic imitation which are so readily produced in the cataleptic state; the echoing of any utterance, or echolalia. . . . In this state also the subject automatically imitates all the gestures of the experimenter (Charcot)."

On pages 324-325 we find, in connection with one of the leaders of the opposition to Charcot: "Moreover, as Bernheim has observed, many subjects who have been previously hypnotized may, without being hypnotized anew, display in the waking state an aptitude for the same suggestive phenomena. . . ." Soon thereafter is a direct reference to Charcot: "Charcot, after repeating these various experiments, has shown that there is no breach between the somnambulist, and the subject liable to suggestion, but only a gradual transition which enables us to understand psychical paralysis, and which demonstrates its reality." Charcot's name is not always included in references to the experimental work done at the Salpêtrière whether or not he had actually been involved, and it is doubtful, therefore, that every mention of him should necessarily be interpreted as a gratuitous, deferential allusion. Thus, the sentence following the last quotation reads: "The experimenters of the Salpêtrière have aimed more especially at throwing into relief, according to the experimental method indicated above, the clinical characters of the paralysed limb." Again direct reference is made to Charcot (page 327): "With respect to the distribution of the anaesthesia, Charcot has recently ascertained that in some subjects anaesthesia is exactly coextensive with the paralysed region." Toward the end of the book in still another reference, one wonders if the authors need have credited Charcot so pointedly if the state of affairs had not warranted it, when they said (page 350): "Profound hypnotism, studied with so much precision by Charcot, has triumphed over the general indifference which stifles inquiry."

Why have these excerpts been taken from *Animal Magnetism* and who were the authors? The choice of the volume is significant because it consists of an intensive evaluation of a series of studies that are representative of the Salpêtrière or Paris school of hypnosis associated with Charcot's name. (Bernheim and Liébeault were of the opposing Nancy school.) This volume is accepted as one of the classics in the history of hypnosis. Who were the authors? Alfred Binet (1857-1911), who achieved fame as a psychologist, is said by E. G. Boring,[2] the historian of psychology, to have been "France's greatest psychologist of that generation." With Henri Beaunis he founded the first French laboratory of psychology in

1889 at the Sorbonne and in 1895, *L'année psychologique*, the first French psychological journal. Later, his name was to become associated indelibly with the tests for evaluating intelligence of school children. Binet's collaborator was Charles Féré (1852-1907) whom Gardner Murphy[7] credits with the discovery in 1888 of electrical phenomena associated with emotion and who designated the psychogalvanic reflex. His studies on fatigue are mentioned, too, and he is said to have introduced the first ergograph to measure muscular energy expended. Murphy notes that, "The latter experiments are associated with his celebrated doctrine of dynamogenesis." Féré's name appears twice in Guillain's book, but only in passing as a student of Charcot. Binet is not mentioned at all. Nor is there any reference to *Animal Magnetism* in Guillain's discussions of hypnosis.

It is curious and of interest that Charcot's alleged role as an observer of hypnosis rather than an active hypnotist, with his reliance on the preparatory activities of his interns and assistants, provides for Guillain a reason for criticism and an explanation for Charcot's deficiency in his hypnosis research. Yet Charcot's similar aloofness and his reliance on others to prepare patients for clinical neurological study evokes for Guillain a fascinating image of the man at work and an awesome respect for his intellect. To illustrate, on page 52 of Guillain's biography we capture this portrait of Charcot in consultation:

> He would seat himself near a table and immediately call for the patient who was to be studied. The patient then was completely undressed. The intern would read a clinical summary of the case, while the master listened attentively. Then there was a long silence, during which Charcot looked, kept looking at the patient while tapping his hand on the table. His assistants, standing close together, waited anxiously for a word of enlightenment. Charcot continued to remain silent. After a while he would request the patient to make a movement; he would induce him to speak; he would ask that his reflexes be examined and that his sensory responses be tested. And then again silence, the mysterious silence of Charcot. Finally he would call for a second patient, examine him like the first one, call for a third patient, and always without a word, silently make comparisons between them.
>
> This type of meticulous clinical scrutiny, particularly of a visual type, was at the root of all Charcot's discoveries. The artist in him, who went hand in hand with the physician, played an interesting part in these discoveries.

Further on, Guillain writes (page 174): "As a result of the experiments performed at the Salpêtrière in hypnotism, certain controversial conclusions were drawn regarding the question of malin-

gering and the influence of suggestions made to the patients, whether consciously or unconsciously. The Nancy school had every reason to protest as it did." Yet in *Animal Magnetism* which, as already said, was not mentioned in the biography, Binet and Féré wrote (page 73) of their well-known predecessor[3] in hypnosis research:

> Braid seems to have foreseen the charge of simulation, and he takes care to affirm that several of his phrenological experiments were performed on persons who knew nothing about phrenology and whose honour was unimpeachable. It is easy, up to a certain point, to understand the strange illusion of which Braid was the dupe. He had not observed the importance of that frequent source of error called *unconscious suggestion* [italics by Binet and Féré]. It is now known that an indiscreet word uttered before subjects very sensitive to suggestion is enough to show what is expected of them, and to make them act in the sense intended by the operator. A gesture may sometimes produce the same effect, and this explains how, in some public exhibitions, the magnetizer, having agreed with his subject to deceive the spectators, is able to make him obey mental orders without expressing them verbally. There is in reality no communication by thought, but by signs which are comprehended by the subject with extraordinary quickness of perception. In Braid's experiments it is probable that something analagous occurred, although there was no imposture. Braid was doubtless as honest as his subjects, but the latter unconsciously obeyed a gesture or word, or were unconsciously influenced by the recollection of a previous *séance.*

Here we have Binet and Féré criticizing Braid in a way that they in turn, as the main experimentalists representative of the Charcot school, were to be criticized later. Yet they apparently made every attempt to avoid the flaw of which it was to be claimed they had not been wary. Surely an ironic note!

Two criticisms are often leveled at the Charcot school of investigators. One is that they had little awareness of psychological issues and influences in connection with their studies. This is not borne out in examination of their work. The other, perhaps more important for this discussion, is that attempts were not made to control their experiments. A study of the Binet-Féré volume should be sufficient to overrule this claim.

The findings of Charcot and his assistants obviously implied errors in general method or technique and erroneous conclusions drawn from observations, perhaps faulty observations at times. The details may be difficult to pinpoint, and in some ways it may never be possible to fathom accurately the precise causes for conclusions that did not stand the test of time. This, however, is not unusual in the history of science, and perhaps it is important to accept the fact that in some areas an investigator can furnish re-

markable advances that stand up well long thereafter, whereas in other areas, despite devotion and integrity to scientific efforts, the conclusions reached and views expounded are outweighed by the work of others. No excuse or apology is necessary although a sincere interest in attempting to account for the differences is commendable. In the case of Charcot, Binet and Féré, it must be remembered that they were not alone in producing work, the results of which were overshadowed by others. A contemporary group, less well known, described as the School of the Hôpital de la Charité, made some findings and reached conclusions similar at times to the Charcot faction and suffered the same fate.[9] It is of interest that the leader of this circle was Jules Bernard Luys (1828-1897), the distinguished clinician and neuroanatomist.[4] Of further interest in the light of our discussion is the claim regarding his efforts in hypnosis, "Little came from his work in this field for he allowed himself to be deluded by his patients. . . ."[6]

Charcot's work has clearly made its way not only in the history of neurology but meaningfully in the history of hypnosis specifically, and of psychiatry in general.[10] Rosen[8] has said of him, "Charcot died in 1893, and this date may be taken as marking the end of a definite period in the history of hypnosis. The work of Charcot and Bernheim brought to a conclusion the development initiated by Mesmer. At the same time, it provided a point of departure for development or modification by those who followed."[11] Regardless of the faults of his work, Wechsler[13] undoubtedly expressed the belief of many regarding Charcot's achievement for his time when he said, "He made hypnotism respectable."

Charcot focussed attention on many hypnotic phenomena allegedly related to physical stimulation primarily.[11] The phenomena were believed to be neuroanatomically and neurophysiologically significant but not well understood. They included "contractures" and anesthesias induced by pressure on areas of peripheral nerve distribution. They were produced most conspicuously in grossly hysterical patients, were dramatic and readily demonstrable, and resulted in such patients receiving special attention in the hypnosis studies. As a result, the hypnotic phenomena themselves came to be associated with psychopathology. The identification of hypnotizability and hypnotic phenomena with psychopathology was viewed then as representative of Charcot's opinions.

Associated with Charcot were the stages of hypnosis called lethargic, cataleptic, and somnambulistic. The first was represented

by muscular contractions elicited by pressure over peripheral nerves. Some of these patients were believed also to possess auditory anesthesia. Cataleptic rigidities were characteristic of the second stage which could be introduced by opening the eyes of a hypnotically lethargic subject, or induced directly and initially by sudden loud noises such as that of a Chinese gong which was part of the Salpêtrière apparatus. A stimulus like rubbing a subject's forehead could induce the somnambulistic stage. In it, considerable physical and mental activity was displayed by the patient in contrast with the rigid, automaton-like behavior that categorized the cataleptic stage. The stages were basically artificial, as is now generally acknowledged, but not any more misleading than many other subdivisions suggested for hypnosis from time to time.[11] I should think that when they were found to be readily induced in the patients used for demonstrations, the dramatic features lent themselves to impressive display for Charcot's receptive audiences.

The experimental aspects of hypnosis with particular reference to the demonstrations of psychopathology, hysterical reactions especially, constituted the mark of Charcot's studies. In contrast to this emphasis was the considerable therapeutic interest of the Nancy school, spearheaded by Liébeault and Bernheim, with focus on hypnotizability as an attribute of normal behavior, and the existence of a wide range of hypnotic manifestations unrelated to degrees of personality normality or abnormality. The popularity of Charcot and his authoritative influence not only guided general concern with hypnosis, but through such influence furthered the scientific study of the neuroses.[10] For Charcot, hypnosis was essentially an experimental neurosis. This view has long been discarded by students of hypnosis, but the hypnotic setting itself continues to serve as an excellent aid in experimental studies of the neuroses and the wide range of psychopathology.[11]

The views expressed in Guillain's book on this phase of Charcot's career tend, it seems to me, to do him an injustice that assuredly was not contemplated. The explanation of error, whatever truth there may have been in the basic facts presented, seems to lead down the wrong road. It appears to me that for those interested in this area of Charcot's scientific endeavors, a search elsewhere for the roots of his erroneous concepts would be in order. Fortunately, this difference of opinion does not detract from the high quality of Guillain's biographical achievement.

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Notes and Events

Edited by Dorothy M. Schullian*

An Early Vaccination Letter

Among the recent acquisitions of the National Library of Medicine[1] is a revealing letter written by Dr. Levi Wheaton of Providence, Rhode Island, to his friend and colleague Dr. Moses Younglove, at Cornwall, Litchfield County, Connecticut, on 18 December 1800. The letter illustrates the importance of personal correspondence in keeping abreast of scientific news when there was still but one medical journal published in the country. It also makes clear the difficulties encountered by most physicians, including even the specialists on smallpox, at the first introduction of vaccination—difficulties brought on by ignorance of the proper criteria of successful vaccination, by widespread dissemination of supposed vaccine which was in reality a mélange of infectious matter, and by the clamorous demand fostered by "Dr. Waterhouse's trumpeting."

Levi Wheaton was a well-known physician of Providence. Born in 1761, he studied at Rhode Island College from 1774 to 1776, though his degree was not awarded until 1782. Meanwhile he completed his medical education and served as a surgeon on a privateer during the Revolution. After the war he practised in Hudson, New York, for a number of years, when he probably came to know Younglove. He returned in 1797 to his native Providence, where he established a smallpox inoculation hospital. His early interest in vaccination is apparent from the letter, and despite the efforts of Waterhouse to monopolize the supply, Wheaton was able to secure some cowpox "matter," albeit of doubtful efficacy, in the fall of 1800.[2] Wheaton was later appointed professor of medicine at Brown University, which he also served as a trustee from 1789 until his death in 1851. His bibliography includes articles on yellow fever, calomel, and cholera.[3]

Moses Younglove, a man of some local note in his day, was the third son of Isaiah and Mary (Lucas) Younglove. Born near Bound Brook, New Jersey, 23 April 1752, Moses moved with his father's family to the New York frontier in 1772 to settle an 800-acre tract of virgin land. He fought during the Revolution "for the liberty that God and nature gave him," serving as surgeon in the militia under General Nicholas Herkimer. He was taken prisoner on 6 August 1777 at the battle of Oriskany, and endured a harrow-

* Cleveland, Ohio.

1 I am indebted to Dr. Dorothy M. Schullian for bringing this letter to my attention.

2 Blake, John B. *Benjamin Waterhouse and the introduction of vaccination: a reappraisal.* Philadelphia, University of Pennsylvania Press, 1957. 95 pp. (p. 22).

3 Biographical notice of the late Dr. Levi Wheaton. *Boston med. surg. J.*, 1851, *45*, 213-216; Kelly, Howard A., and Burrage, Walter L. *Dictionary of American medical biography.* New York, D. Appleton and Co., 1928. xxx, 1364 pp. (pp. 1288-1289).

ing period of captivity.[4] A Moses Younglove, presumably the same man, also served as one of five representatives from Tryon County at the second session of the New York State Assembly, between October 1778 and March 1779.[5] At some subsequent date he moved to New Lebanon (then part of Canaan), Columbia County, New York, where we find him in 1790, one of the few citizens who owned a slave and evidently prospering.[6]

Dr. Younglove, according to a local historian, "was quite prominent in his time, and especially skillful in his treatment of smallpox and kindred diseases. Before vaccination was discovered he had a pesthouse, to which patients resorted in large numbers."[7] His prominence as a smallpox inoculator explains his presence in Cornwall in 1800: he had gone there during an epidemic to undertake a general inoculation.[8] Of Younglove's later history little is to be found. He is said to have died in Hudson, New York, in 1829.[9]

A transcript of the letter follows:

Providence Dec^{r}. 18th 1800

Sir,

Your Letter of the 3rd inst. I did no receive untill this day. I am obliged to you for the points you give of your improved treatment of smallpox, I have long believed a more generous diet might be allowed inoculated patients in many, if not most instances, but since my residence in this Town my practice in that way has been mostly confined to the Hospital, where it is necessary to adopt a general & uniform mode of living, as partial indulgencies would likely be misconstrued or abused by those, for whom they might be improper.

In reply to your enquiries concerning the Cowpox, I obtained about 2 months since a little of the matter which I had reason to believe genuine, with this I have Inoculated several & in a few instances have, I believe, succeeded in producing the disease, in others it has failed. Since Dr. Waterhouse's trumpeting about the Business, the practice has become pretty general in the Country towns between this & Boston. Physicians from their Ignorance of appearances which might be occasionally induced by introducing *vitiated pus merely* under the Skin, have misstaken inflammation & Redness when considerable for the specific disease in question, and as it is commonly attended with no eruption, this mistake might easily happen, the uncertainty which they frequently discovered to their patients about the reality of Infection, from the want of a sufficiently *precise* knowledge on the subject, has bro't the business in to a good deal of disrepute, and for my

[4] Kelsey, Mrs. W. A. The Youngloves in military service of the U.S.A. N. p., n. d., 8 ll. Typescript in Library of Congress; Campbell, William W. *Annals of Tryon County*. 4th ed. New York, Dodd, Mead and Co., 1924 (first published 1831). xx, 257 pp. (pp. 83-85, 226-234).

[5] New York (State), Comptroller's Office. *New York in the Revolution as colony and state*. Albany, J. B. Lyon Co., 1901-1904. 2 vols. (2, 155).

[6] U. S. Bureau of the Census. *Heads of families at the first census . . . 1790*. Washington, Government Printing Office, 1907-1908. 12 vols. (*New York*, p. 58).

[7] Ellis, Franklin. *History of Columbia County, New York*. Philadelphia, Everts & Ensign, 1878. 447 pp. (p. 313).

[8] Starr, Edward C. *A History of Cornwall, Connecticut*. New Haven, The Tuttle, Morehouse & Taylor Co., 1926. 547 pp. (p. 166).

[9] Kelsey, *op. cit.*; Campbell, *op. cit.* (p. 83).

own part, I must acknowledge I myself have felt rather disposed to put by applicants for the present, in hopes of receiving more ample information.

In regard to its sufficiency to secure people from the Smallpox, I have no doubts, the only thing wanting is a certain criterion to determine when patients have passed the disease.

The matter is obtained from pustles when they appear, as in smallpox, or from the arm while the patient is under the febrile symptoms, a lancet should be passed flat in under the Cuticle about this distance > and a piece of infected thread slipt under, so that the Cuticle may be closed upon it, I believe it not so active a Contagion as smallpox, whence greater irritation should be excited to ensure infection, a *moderately* abstemious living should be recommended and a cooling Cathartic given, *to most people,* the evidence of Infection are Inflammation in the part, soreness under the arm, and in 4 to 10 days, sickness at stomach, Chills & fever with Head & Back Ackes &c. I am in daily expectation of further communications on this subject, at present the above is a hasty sketch of what I know of it. The exceedingly small quantity of matter I have by me will scarce admit of division & besides for reasons above assigned I should advise you to abide by the old fashion at present, as soon as my mind is better made up I will write you & if possible forward you some of the matter. I should be as much gratified as yourself to have an interview once more, if Business should send you any where within a days ride of us, I hope you will come & see us, a bed & pot luck shall always be at your service. Pray write me as opportunity may present. I must stop or make a double Letter.

Your assured friend
Levi Wheaton

Mrs W. & family in
health, desire to be
held in remembrance.

JOHN B. BLAKE

The First Edition of Digby's POWDER OF SYMPATHY

Sir Kenelm Digby's *Discours fait en une celebre assemblée . . . touchant la guerison des playes par la poudre de sympathie . . .* Paris, 1658, is perhaps now considered one of his least creditable productions, but was the most widely translated and reprinted of any of his writings during the 17th and early 18th centuries. There were two English editions in 1658, the same year the first edition in French was published in Paris. It was translated very rapidly into Latin, Dutch, and German, there being at least forty-five editions by the middle of the eighteenth century.

Ferguson, in *Bibliotheca Chemica,* I, 213, confesses that there was confusion concerning the first English and French editions. He says, "In my 'Notes on . . . Books of Secrets,' written before I had seen the first English edition or any notice of it, I suggested that the French edition might have been regarded as the first, and that the English translation might have been called the second edition, though it was the first of the translation. That, however, was incorrect, for there is really a first English edition, although it is very rare."

DISCOVRS
FAIT EN VNE CELEBRE ASSEMBLE'E, PAR LE CHEVALIER DIGBY, CHANCELIER DE LA REINE DE LA GRANDE BRETAGNE &c.

TOVCHANT LA GVERISON des Playes par la Poudre de Sympathie.

Où ſa compoſition eſt enſeignée, & pluſieurs autres merueilles de la Nature ſont déueloppées.

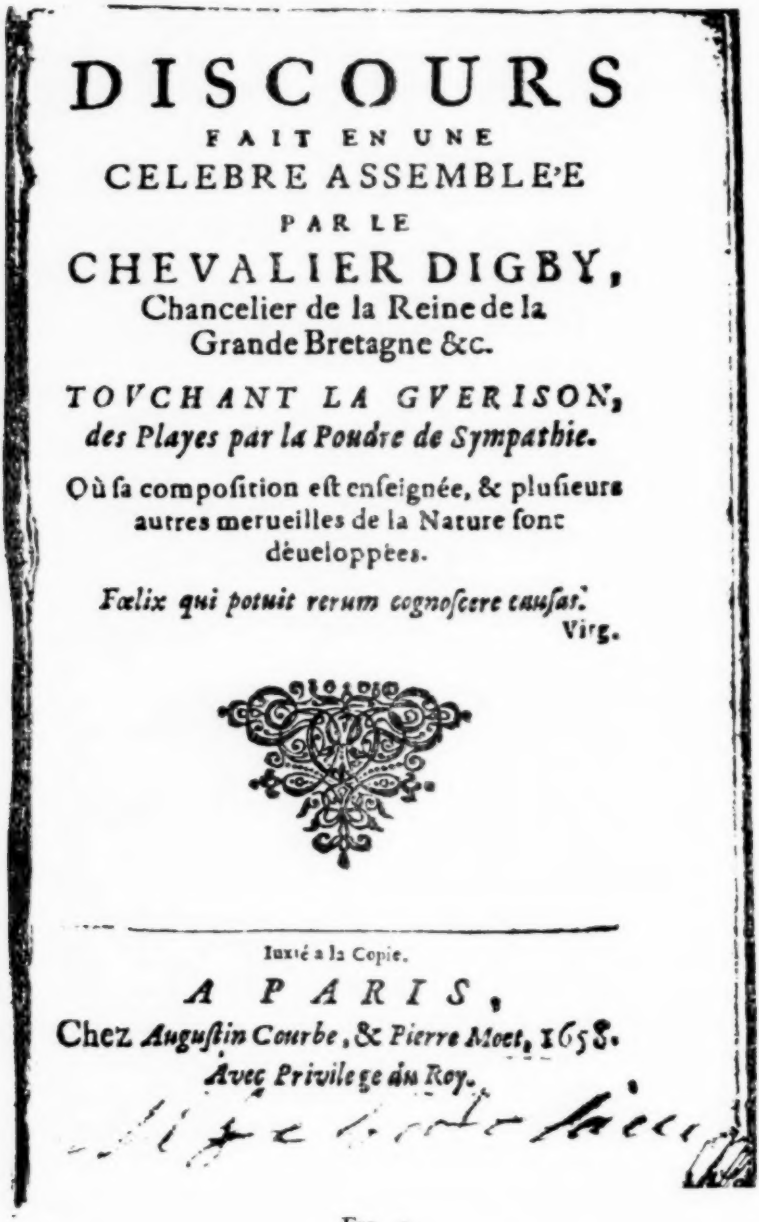
Felix qui potuit rerum cognoſcere cauſas.
Virg.

A PARIS,
Chez AVGVSTIN COVRBE', en la petite Salle du Palais, à la Palme.
ET
PIERRE MOET, Libraire Iuré, proche le Pont S. Michel, à l'Image S. Alexis.

M. DC. LVIII.
AVEC PRIVILEGE DV ROY.

FIG. 1.

In addition to this confusion about the first and second English editions of 1658, there has also been confusion about the first French edition. A bookseller's catalogue recently listed a copy of the first edition of Digby's *Discours* . . . , Paris, 1658, octavo. There was an appended note that the edition had been "wrongly described as 12mo in *Bibliotheca Osleriana*." While in Montreal shortly after Dr. Francis' death I asked about this book at the Osler Library. The librarian said it was very unlikely that Dr. Francis could have made such a mistake. Examination of the book



DISCOURS

FAIT EN UNE

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PAR LE

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TOVCHANT LA GVERISON, des Playes par la Poudre de Sympathie.

Où ſa compoſition eſt enſeignée, & pluſieurs autres merueilles de la Nature ſont dèueloppèes.

Fœlix qui potuit rerum cognoſcere cauſas.
Virg.

Iuxté a la Copie.

A PARIS,

Chez *Auguſtin Courbe*, & *Pierre Moet*, 1658.

Avec Privilege du Roy.

FIG. 2.

(B.O. 2453) showed that Dr. Francis was indeed correct, that the book was 12mo rather than 8vo. Sir William Osler's pencilled notation "This is the first edition" is incorrect: this is a little known reprint edition of the same year. I have copies of both editions and reproduce their title pages herewith. The two editions may be described as follows:

1. Discours First French Edition, 1658 8°

Title: [see Fig. 1]

Collation: 16.3 cm. A-M^8 N^4 (N^4 blank?); 100 ll. pp. 1-195 [*196-197*] [3].

Contents: A1*a*, title (verso blank); A2*a*, Discours . . . ; N2*b*, Extrait du Privilege du Roy; N3*a*, Fautes survenuës en l'Impression.; N3*b*-4*b* blank.

2. Discours Second French Edition, 1658 12°

Title: [see Fig. 2]

Collation: 12.8 cm. A-E^{12} F^4; 64 ll. pp. 1-127 [*1*].

Contents: A1*a*, title (verso blank); A2*a*, Discours . . . ; F4*b*, blank.

K. GARTH HUSTON

Dr. Brodman Accepts New Position

Dr. Estelle Brodman has accepted the position of Associate Professor of Medical History in the Department of Anatomy and Librarian of the Washington University Medical School at St. Louis to take effect at the beginning of the 1961/62 academic year. Previously Dr. Brodman was connected with the medical library of Columbia University, while for the past twelve years she has been with the National Library of Medicine as its Assistant Librarian for Reference Services and since September 1960 its Associate for Extramural Planning. She is the author of two books, *Bibliographical Lists for Medical Libraries,* and *Development of Medical Bibliography,* and of about 50 articles on historical and library subjects. She has taught at Columbia University and at Catholic University. Her undergraduate work was done at Cornell University; her graduate work at Columbia and Catholic Universities, UCLA, and the University of New Mexico.

Historical Gleanings

Zinjanthropus, whose relics, aged 600,000 years and more, were mentioned in the Journal, 1961, *16*, 78, has now been "considerably" antedated by another find of the British anthropologist L. S. B. Leakey. The "new" bones, found in Olduvai Gorge in Tanganyika, East Africa, include the skull, parts of the hands and a foot, the greater part of the jaw, and a collarbone of a child 11 years old.

A recent syndicated column of Dr. Walter C. Alvarez was devoted to Dr. Wilder Penfield's novel *The Torch* and thereby to Hippocrates. It will be of interest to friends of Dr. Alvarez that his son Dr. Luis W. Alvarez, physicist at the University of California, received recently the $5,000 Albert Einstein Award and gold medal for 1961.

Medicinal properties are included in the discussion which Alfred C. Andrews provides in *Classical Philology*, 1961, *56*, 73-82 of the use of marjoram as a spice in the classical era.

The New York Academy of Medicine lent its famous ninth-century manuscript of Apicius for the exhibition "Gastronomy: the Art (or Science) of Good Eating" which opened at The Grolier Club in December, 1960.

Paul Oskar Kristeller has published in *Renaissance News,* 1961, *14,* 11-14 a letter from the physician Daniel Scevola to Erasmus in Siena. It was written from Ferrara and is dated 22 December 1509. Scevola may have been a pupil of Nicolaus Leonicenus, whose greetings he sends with the information that Leonicenus has just published his translations of the *Aphorisms* of Hippocrates, of Galen's commentaries on them, and of the latter's *Ars parva,* as well as his notes on Pliny. The letter is preserved at the Biblioteca Nazionale, Firenze, in codex Magl. VIII. 1358.

On 13 May 1959 Mr. W. R. LeFanu, Librarian of the Royal College of Surgeons of England, delivered as his presidential address before the Huguenot Society of London a study on the refugee printer, bookbinder, publisher, and bookseller Thomas Vautrollier. This was published in the Society's *Proceedings,* 1959, *20,* 12-25. Vautrollier was born at Troyes in Champagne. There are records of his activities in London and Edinburgh from October 1564 to July 1587; among the almost 150 books which he produced was the first edition, 1583, of Philip Barrough, *The methode of phisicke* (STC 1508). The same issue of the *Proceedings* contains several reviews by Mr. LeFanu and a request, at the instance of M. Jean D. Candaux of Geneva, for information on one Peyrenc who is said to have been surgeon to King William III.

Ambroise Paré's apophthegm, in the neat English translation "Man Tends, God Mends," is carved in an oak panel above the altar in the chapel, gift of Mr. and Mrs. John Sherwin, which was dedicated at the Cleveland Clinic Hospital on 1 October 1960 in memory of the four founders of the Clinic, Dr. Frank Bunts, Dr. George Crile, Dr. William Lower, and Dr. John Phillips.

The library of Henry Percy, ninth Earl of Northumberland (1564-1632), which is described by G. R. Batho in *The Library,* Fifth Series, 1960, *15,* 246-261, contained many of the works of Paracelsus; the earl had also a special interest in anatomy and annotated the Plantin edition, Antwerp, 1566 of Valverde's *Vivae imagines* and the complete works of André Du Laurens. By his scientific experiments in general he earned the sobriquet "The Wizard Earl."

The treatise entitled *The Indian Nectar* (London, By J. C. for Andrew Crook, 1662, Wing S6049), by the practising physician Henry Stubbe, is the first English book on chocolate. It and its author are competently and delightfully examined by C. F. Main in *The Journal of the Rutgers University Library,* 1960, *23,* 33-47.

The address "Leibniz und die Medicin," delivered by Johannes Steudel on 15 November 1958 when he was installed as rector of the University of

Bonn, has been published as No. 20 of *Bonner akademische Reden*, Bonn, Peter Hanstein Verlag, 1960, 32 pages.

A number of the line engravings published in William Cheselden's *Osteographia* (1733) are credited by the author in his address to the reader to a Mr. Shinevoet. In an article in *Oud-Holland*, 1960, 54-58 W. R. LeFanu discusses these and other works of Jacobus Schijnvoet of Amsterdam, who was active as an engraver in London in the early eighteenth century. The original drawings for the *Osteographia* are deposited at the Royal College of Surgeons of England. Mr. LeFanu, whose talents are often mentioned in these pages, has recently published also an edition of *Betsy Sheridan's Journal* (London, Eyre & Spottiswoode, 1960, xii, 223 p.; also New Brunswick, New Jersey, Rutgers University Press), which contains the letters written to his great-great-grandmother Alicia LeFanu in Dublin in 1784-1786 and 1788-1790 by her and Richard Brinsley Sheridan's younger sister Elizabeth. No claim is made here for their medical content, but they are certain to give great delight to anyone interested in a first-hand, thoughtful, and entertaining account of "18th century life as lived in what may be called the respectable Bohemia of actors, artists, and writers." Mr. LeFanu has supplied an excellent introduction and helpful, concise notes. In the words of the *Times Literary Supplement*, he "presents all his characters with unobtrusive skill, and it is clear that he knows them with the intimacy of old acquaintance. They are worth knowing."

Physis, 1960, 2 carried on pages 213-222 an article by Luigi Belloni entitled "Per la storia dell'innesto del vaiuolo a Milano" and published in honor of the 85th birthday of the great hygienist and medical historian Andrea Corsini. On pages 223-231 Mario Randelli presented a study of "La *Anatome ossium* di Domenico Gagliardi."

Quacks and patent medicines lured the common man of the Jacksonian era as he sought relief from his ailments. The circumstances are examined by James Harvey Young in his article "American Medical Quackery in the Age of the Common Man" (*The Mississippi Valley Historical Review*, 1961, *47*, 579-593).

In *L'Archivio di Stato di Roma* (Roma, Istituto di Studi Romani, 1960) Armando Lodolini has furnished a brief guide to the archives of the Amministrazione Centrale dello Stato Pontificio. Chapter 8, pages 96-104, deals with archives from various hospitals.

A word of tribute should be set down here for Carl Purington Rollins, who during the years of his service as Printer to Yale University designed many publications in the field of the history of medicine. Mr. Rollins died on 20 November 1960 at the age of 80.

Once again (cf. Journal, 1960, *15*, 206-208) the Medical-Historical Museum in Stockholm has joined hands with the Danish Society for the History of Medicine to present, under the editorship of Wolfram Kock and

the assistant editorship of Egill Snorrason, a yearbook, *Medicinhistorisk Årsbok,* 1960, containing a wide range of articles of value for the history of medicine, some printed for the first time and some reprinted from various journals. The articles are summarized in English. After reports by Dr. Kock on activities at the Museum during 1960 and by Dr. Snorrason on the 1960 program of the Danish Society for the History of Medicine, the following studies are offered: Dr. Kock on the Seventeenth International Congress of the History of Medicine, on Pehr Henrik Malmsten, on the Swedish Medical Society and the Karolinska Institute, and on the Wallenström collection of postage stamps; Peter Richards on leprosy in Scandinavia; Arne Bertelsen and Norman Capener on the schedules of disability in the laws of King Canute; S. Henry Wassén on Aztec medicine; Hans Schlesch and also Mogens Wellendorf on a poisoning case in Denmark in 1593; Axel Garboe on Niels Stensen's lost geological manuscript; Frey Lundmark on Johan Stensson Rothman; Telemak Fredbärj on the dissertations (Lund, 1717) of Johan Christopher Heyne and Lars Braun; Josua Tillgren on Linnaeus and alcohol; Bengt Lundström on the illness and death of Napoleon; Albert Hansen on Pasteur's relations with Danish scientists; Erik Jorpes on the physicist Svante Arrhenius; Hans Wulff on Ferdinand Sauerbruch; Kurt Kaijser on nurses' brooches in Sweden; Åke B. Löfgren on emblems of the Swedish Dental Federation; and Åke Lydman on Finnish collections in the history of pharmacy.

The Centre Régional de Documentation Pédagogique of Toulouse mounted recently an exhibition entitled "Le Corps Humain et les Étapes de sa Découverte." The catalogue of 38 pages was dated 1960 and carried a preface by Marcel Sendrail. Included were 101 items, whether prints, books, manuscripts, or photographs, representative of studies in anatomy, the circulation of the blood, transfusion, respiration, digestion, graphic representation, and artistic anatomy.

In *The Leech,* Journal of the Cardiff Medical Students Club, Autumn 1960, a New York physician and medical historian who is familiar with the literature of hoaxes and who signs himself S. N. Gaño discusses deficiencies in the English medical vocabulary. Instead of inquiring, e.g., whether a patient ever suffered from icterus, the physician should be able to ask, "Did you ict?"

Dr. Wilburt C. Davison, good friend of the history of medicine who last year retired from the post of dean of the Duke University School of Medicine, has been elected trustee of the Duke Endowment, a philanthropic organization located at 30 Rockefeller Plaza, New York.

The *Antiquarian Bookman,* 20 February 1961, pages 635-640, published the address "Value & Worth of Rare Books" which was delivered by Edwin Wolf, 2d before the Antiquarian Booksellers Association of America at The Grolier Club on 7 February. Many dealers, librarians, and collectors will be

startled at the question on page 636 which asks, "What in the world would the vendors of old medical books do without Garrison-Morton?"

The Doctor T. G. H. Drake Collection (cf. Journal, 1960, *15*, 31-44 and 301-302), which contains some 1500 early books and more than 3000 specimens in the field of paediatrics, was formally opened on 11 April 1961 at the Academy of Medicine, Toronto. Dr. Robert D. Gauchat, Assistant Professor of Paediatrics at the State University of Iowa, gave the dedicatory address, which was entitled "The Future of our Past."

At the symposium on the history of Byzantine science which was held at Dumbarton Oaks 4-6 May 1961 under the direction of Milton V. Anastos a paper entitled "Byzantine Medicine: Tradition and Empiricism" was read by Owsei Temkin.

On 10 May 1961, in celebration of the publication of his book *Daniel Drake, M.D. (1785-1852): Pioneer Physician of the Midwest* (Philadelphia, University of Pennsylvania Press) Dr. Emmet Field Horine was honored by a special convocation at the Rankin Amphitheatre of the Louisville General Hospital, Louisville, Kentucky. The principal address was delivered by Walton B. McDaniel, 2d on the subject "Medical Liaison between Louisville and Philadelphia." Three bound volumes containing his collected publications were presented to Dr. Horine by Woodrow M. Strickler, Executive Vice-President of the University of Louisville, who announced that in June the University would confer on him the honorary degree of Litt.D. A bibliography of Dr. Horine's publications, compiled by Eugene H. Conner and numbering more than 90 items, accompanied the program for the occasion.

Book Reviews

The Folger Library: A Decade of Growth, 1950-1960. Washington, The Folger Shakespeare Library, Administered by the Trustees of Amherst College, 1960.

Reviewed by DOROTHY M. SCHULLIAN, *Editor, Notes and Events.*

NAMES are interesting. The eminent library which is neighbor to the Library of Congress and which does *not* issue annual reports is called The Folger Shakespeare Memorial Library in Joseph Quincy Adams' report on its progress during the years 1931 to 1941. The present report is the second and covers the years 1950 to 1960; in it Louis B. Wright drops the descriptive adjective and the institution is formally termed in the imprint The Folger Shakespeare Library. It is, however, the title of the report which most accurately reflects the broadened program of the library; as The Folger Library it performs its functions today and as The Folger Library it wins the affections of scholars the world around.

It has, since it opened its doors in 1932, become an important research institution "devoted to the study of the civilization of the European Renaissance and of the whole of the Tudor and Stuart periods." The present report gives a stirring account of its earlier history, of its expansion and development, of the exciting purchases and gifts made through the years, and of the varied activities which it fosters. Acting on the theory that "the best teacher has almost invariably been a good scholar" and realizing that many faculty members in crowded universities can find little opportunity for research, Director Wright furnishes an oasis where they may receive refreshment and inspiration and effectively use the source materials and reference tools in the history and literature of the 16th, 17th, and early 18th centuries.

The collections include significant and extensive materials in technology, medicine, agriculture, mathematics, and the various natural sciences. Many holdings in these fields came in 1938 with the collection of Sir Leicester Harmsworth; purchases continue, and during the past decade early editions of such authors as Copernicus, Brahe, Kepler, Galen, Vesalius, William Harvey, Newton, Boyle, Hobbes, Gesner, Guillemeau, and Dodoens have been added. The historian of medicine and science must hereafter take account of the holdings of The Folger Library. He will encounter there one advantage which no purely scientific library can offer him, for as in the Tudor and Stuart periods "scientific interest was not confined to specialists but was the concern of all," so here he may consult, whether in economics or religion or humanism, in law or travel, in music or painting or drama, the supplementary materials which alone can set his scientific sources in the framework of the civilization which produced them.

Copies of the report will be sent by The Folger Library to any interested person. Whoever wishes to follow currently the happenings at this distinguished institution should consult the newsletters which it issues at least once a year. In Volume 9, Number 1 of these, e.g., dated 20 May 1960, it is demonstrated in merry style under such headings as "Frenzy in Washington," "Convocations of Scholars," "Colonel Blimp on Parnassus," and "Justification for Tea" that scholarship need not be dull and is certainly not so at The Folger Library.

FREDERICK G. KILGOUR. *The Library of the Medical Institution of Yale College.* New Haven, Yale Medical Library, 1960. 74 pp., $2.75.

Reviewed by DOROTHY M. SCHULLIAN, *Editor, Notes and Events.*

ITS early catalogues, manuscript or printed, are a proud possession of any library. The one which Courtney Smith Kitchel, A.B., Yale, 1865, completed on 25 February 1865, and for which he received the sum of $36.00 four days later, waited long for publication. On 29 October 1960, however, it became in its new dress a particularly felicitous contribution to the sesquicentennial celebration of the Yale University School of Medicine. Carefully edited, it is significant both for the development of medical education and for the history of the Yale Medical Library in its first fifty years.

In its original form the catalogue was arranged alphabetically by author and in the case of anonymous works by title. Two pages from it, in Kitchel's easily legible script, are reproduced in this edition. It had 659 entries representing 1,204 volumes. The editor has here rearranged them into almost fifty classes on the basis of the scheme used by Emil Fischer in 1857 for the catalogue of the medical library of the Pennsylvania Hospital, revealing thereby, as a senior in Yale College in 1865 was scarcely qualified to do, the subject content of the collection. Author approach is still immediately possible through the index.

Anatomy, physiology, hygiene, materia medica, pharmacy, therapeutics, pathology, the practice of medicine, surgery, midwifery, medical jurisprudence, and "medical literature" are well represented; serials by comparison are few, there is a small collection on general science, and the litterae humaniores have a place. The earliest books are a 1675 Cocke, a 1695 Dionis, and a 1697 Sydenham; editions falling within the period 1800 to 1840 are the most numerous. Some titles were present in 1865 in more than one copy, and we are glad to learn from the helpful history of the library which is prefixed by the editor, and which relates in particular the contributions of Nathan Smith, Lewis Heermann, Edward Henry Leffingwell, Elisha North, and Charles Hooker, that as early as 1836/37 the library was benefiting by the sale of duplicates. Most important, the library was used, as is proved both by the records and by the student embellishments in original copies of some 330 entries which are now preserved in the Yale Medical Library or the Yale University Library.

Whoever has tried to identify editions listed sketchily in a receding past by a non-professional bibliographer will understand the labor which was necessary to set these entries down in today's accepted practice. The labor was thorough, and even in entries with Latin titles the typographical errors are extremely few. From symbols which are assigned in brackets we learn that about forty genuinely medical items present in 1865 are now lacking to the Yale Medical Library in any copy. Surely these will stand very high on its present list of desiderata.

CARLO FRATI. *Catalogo Descrittivo delle Opere a Stampa di Marcello Malpighi e degli Scritti Che lo Riguardano.* London, Dawsons of Pall Mall, [1960?]. 56 pp.

Reviewed by HOWARD B. ADELMANN, *Professor of Histology and Embryology, Cornell University, Ithaca, New York.*

THIS bibliography originally appeared in Ugo Pizzoli's *Marcello Malpighi e l'Opera Sua* (Milano, 1897) and was also issued as a separate. Since it has long been very difficult to find in either form, students of Malpighi will welcome this convenient photolitho reprint of the separate issue. An introductory section describes the principal collections of manuscripts. Editions of the *Opera Omnia*, the separate treatises, and miscellaneous letters comprise the 60 items listed in Part I. Part II describes 83 items dealing with Malpighi's life and works, 13 concerning Malpighi's teachings and the controversies they aroused, 15 works addressed to or dedicated to Malpighi, and 8 engraved portraits of him. Quite complete for Malpighi's own works up to 1897, and admirably accurate throughout, it has never been superseded.

WALLACE B. HAMBY. *The Case Reports and Autopsy Records of Ambroise Paré.* Springfield Illinois, Charles C Thomas, 1960. xx, 214 pp. $6.50.

Reviewed by JOHN P. RIESMAN, *New Haven, Connecticut.*

HERE we have a fine little volume containing excerpts from the clinical reports and bedside teaching notes of the father of modern surgery—that lovable Renaissance barber-surgeon, Ambroise Paré. A real service has been done by Dr. Hamby in providing us *not* with another biography of M. Paré—there are already several of these—but with a portable and eminently readable book in which choice observations of this remarkable 16th century surgeon are well translated.

As Dr. Hamby tells us in his introduction, the only complete translation into English available was by Thomas Johnson (*The Works of That Famous Chirurgien Ambroise Parey Translated Out of The Latin, etc.*) published in 1634. Of course Paré is notable because he wrote only in the French vernacular, when educated surgeons and physicians published and probably discoursed only in Latin; therefore, Johnson's book represents a

translation of a translation. Dr. Hamby observes that for one who does not read French, it will be difficult to find anything of Paré's that is not colored by the flowery Elizabethan language of Johnson. In 1840 Malgaigne produced a rendering from 16th century into 19th century French of the *Oeuvres Complètes d'Ambroise Paré*. From this Dr. Hamby makes a translation into pleasantly readable modern English. He has chosen from Malgaigne's three volumes the most interesting and amusing case reports. These illustrate not only the thoroughness of Paré's observations and the shrewdness of his diagnoses, but provide fascinating details of his surgical treatment which was based on most forward-looking anatomical grounds and physiological beliefs. Paré's practice was immense, bringing him huge social and financial rewards. The names of the patients, their home address and occupation, and the time, place, and circumstances of their injuries, illness, or poisoning are all provided. This book thus becomes a travelogue of French history, geography, and customs during Paré's four-score years of dangerous life (1510-1590), carried on under the generally grateful eyes of no less than seven French kings. This reviewer was inspired to get André Maurois' *History of France* from his local library to enable him to dash around France and down into Northern Italy with that untiring front-line military surgeon, A.P., who must have been as welcome a sight to his fellow soldiers under attack by harquebus and lance as any modern battalion surgeon ever was in a blasted Korean gully.

Four hundred years of traumatic and military surgery have only emphasized, not altered, Paré's most original teaching: that wounds heal best when they are treated gently. He it was who put an end to boiling oil and red-hot iron treatment of wounds. A cogent essay by Boyd Howard Hill, Jr., on Paré's position in reference to experimental science and medicine can be found in the January 1960 issue of this Journal.

Dr. Hamby has appended to each report its page reference in Malgaigne, so that the reader can find the original French text. This I did and this brief experience in watching a skilled translator at work, figuratively over his shoulder, gave me some understanding and appreciation of what Dr. Hamby has done.

The last 45 pages of this newest translation comprise a fairly complete edition of Paré's famous *Apology and Treatise, Containing the Voyages Made in Divers Places*. Here are described the famous amputations using ligatures to staunch the flow of blood, instead of the fiery and brutal methods used by Paré's contemporaries; also the historic lance wound of the Duc de Guise (through the base of the skull and yet "my said Lord, by the Grace of God, recovered"). This famous head injury must be of special interest to Dr. Hamby who is a neuro-surgeon at the Cleveland Clinic.

In addition to its handy size, this book is valuable for a four-page professional chronology of Paré, to which one can refer in reading of his

gruelling trips with The Royal Army of France. A bibliography and index are also provided.

The only criticism which can be made concerns the skimpy binding which was responsible for the loss of two pages as the new book was unpacked. There was a constant fear in the reviewer's mind that the book would fall apart unless he left it safely on his bedside table. Even the outside of this volume has a cheap appearance. There is only one illustration. The price, the subject matter, and the excellence of the writing and editing all call loudly for a sturdier and handsomer book.

ELDRIDGE CAMPBELL AND JAMES COLTON (Trans.) *The Surgery of Theodoric.* New York, Appleton-Century-Crofts, Inc., 1960. xix, 233 pp.

Reviewed by GUSTAF E. LINDSKOG, *Wm. H. Carmalt Professor of Surgery, Yale University School of Medicine.*

IT is a great tragedy that Dr. Eldridge Campbell did not live to see the completion of the second volume in translation of Theodoric's Surgery. The surviving collaborator indicates in his preface that the editorial work for Book III, considerably longer than Book IV, was nearly completed when Dr. Campbell died of cancer in 1956. While certain friends and colleagues, particularly Dr. Frank Berry, Assistant Secretary for Defense, and Miss Gertrude Annan, librarian of the New York Academy of Medicine, contributed generously of their time and talent to facilitate publication of the second volume, there seems little doubt that the guiding hand of that distinguished surgeon and teacher, Dr. Campbell, was greatly missed in the final stages of preparation.

In Book III Theodoric is largely concerned with problems of acute and chronic inflammation, tumors, cysts, and other afflictions of the skin and accessible structures of the body. Since he worked some four hundred years before the invention of the simplest microscope, about five hundred years in advance of Morgagni, and six centuries before the developments in cellular pathology and bacteriology which occurred in the late 19th century, it is not remarkable that Books III and IV are heavier going than the earlier chapters on trauma. The differentiation, for example, between cancer of the skin, "sclerosis," and simple chronic ulceration is hopelessly vague.

There are those critics in the present day who deny Theodoric the virtue of originality; when he flounders through long and repetitious expositions regarding routines of medication admittedly borrowed from Galen and the Arabic masters, it is easy to understand this criticism. However, more significant than these topical inadequacies is the remarkable amount of knowledge and good judgment that Theodoric did possess for his time. In Books III and IV he has moments of sharp clinical discernment. For example, in the chapter on leprosy he mentions signs like anesthesia

and alopecia which are still valid today. He describes a very sound plastic procedure for the correction of gynecomastia. He recognizes the desirability, in cases of gangrene, of amputating the affected part through normally viable, rather than necrotic, tissues. Writing about fistulas of the mandible (Ch. 2) he warns that when infection reaches through the mandibular bone to the roots of the teeth, extractions are necessary to the cure.

Theodoric is at his best in those simpler and specifically surgical problems like hernia (of which he distinguishes inguinal, ventral, and umbilical types), hemorrhoids, fissure, and fistula in ano. In the latter field (now sometimes dignified with the appellation of a specialty), Theodoric is authoritative and often accurate. For example, he describes clearly the curing of external fistula by the use of the seton, the cautery, and by direct excision.

At the other extreme, Theodoric, who was after all a Dominican religious, is not above considering the employment of magic formulae in difficult cases. Toward the end of Chapter I he quotes from the Alexandrian school a fantastic prescription for the cure of fistula, involving the ritual use of a sharpened stick, a freshly picked plant of agrimony, and a recitation of the paternoster. However, he closes this passage with the distinct reservation, "I have set down the aforesaid because there are some who have great faith in procedures of this sort, and perchance their faith helps them." Certainly Theodoric knew how to treat the "whole patient"!

Of greatest interest to the medical historian are the instructions in Book IV, Chapter 8, for the preparation and use of the soporific sponge. This ancient predecessor of inhalation anesthesia was of a much more complex constitution than commonly credited today. Theodoric's concern with anesthesia suggests that he possessed a more sensitive temperament than most of the early chirurgeons. At any rate, the erudition and discipline of his ecclesiastical training and background set him apart from the mere cutters of flesh and bonesetters of his time.

In this second volume, the publishers have done a neat and excellent job; and it makes an attractive and easily readable companion to the first which was published in 1955. There is included a brief index of subject matter for both volumes and some critical notes by Mr. Colton on two English manuscript versions presumed to be derived from Theodoric's text.

JUSTINE RANDERS-PEHRSON. *The Surgeon's Glove.* Springfield, Illinois, Charles C Thomas, 1960. xi, 95 pp. 12 figs. $4.50.

Reviewed by ALLEN O. WHIPPLE (*Valentine Mott Professor of Surgery, Emeritus, Columbia University*), *Princeton, New Jersey.*

THE story of the evolution of wound care and wound repair is long and tragic. It has to do with surgery, the oldest form of therapy. It began in prehistoric ages with the caveman, who in his struggle for existence was frequently in conflict with animals or human enemies. So he received wounds,

incised and lacerated, with bleeding. This demanded immediate treatment by some member of the family, and later by a tribesman, who had the courage and experience in dealing with bleeding, gaping wounds by such crude methods as pressure and the application of moss and cobweb. The first surgeon may have been a frantic mother, rescuing her wounded child from one of the great carnivores.

Today, less than a century after Lister's recognition of bacteria as the cause of wound infection, the care and repair of clean wounds, so often made by the surgeon himself, is approaching the 99 per cent of clean wound healing by primary union. Undoubtedly, one of the reasons for this is the prevention of contamination of the wound from the hands of the surgical team by the use of sterile rubber gloves worn by every member of the surgical team at the operating table.

This book, *The Surgeon's Glove,* is a short monograph of 95 pages. It is not written by a surgeon, but by a woman, Mrs. Justine Randers-Pehrson, M.A. But it is an astonishingly fine piece of research that describes the evolution of the glove and its use first by the obstetrician, later by the pathologist, for different reasons, before it was adopted by the surgeon.

The author documents her many discoveries, scarcely recognized by surgeons, from quotations from the articles by the various individuals that had to do with the development and use of the glove, as well as with a complete bibliography. All this makes her monograph revealing and authoritative.

One of the most interesting discussions in the monograph has to do with the puzzling question of why the use of the glove, as a means of protecting the patient, was so slowly recognized and appreciated by both the obstetrician and the surgeon. An article written by an English surgeon, Robert Storrs, in 1843, very honestly records his fatal cases of puerperal fever and concludes that he himself must have been the transmitting agent. In a paragraph, somewhat ambiguous in his mention of the glove, he said

> I should also, after a post-mortem of any kind, or after an operation upon any case of erysipelas, or of typhus, recommend the most careful ablutions of the hands, and for the surgeon to avoid attendance on a labor in any part of the dress in which such operations have been performed, not forgetting the gloves, as the hand and the arm are the chief instruments of contact.

As the author says, "Why did not Semmelweis, pondering these words with care, see the word 'gloves' and have it unveiled to his mind that there he had the answer to his problem?"

And the astonishing fact is that even after the Pasteur-Lister-Koch break-through in proving the role of bacteria as the cause of wound infection both obstetricians and surgeons were so slow in recognizing the importance of preventing wound contamination by the use of impervious sterile rubber gloves.

Halsted, who knew that the hands could not be made sterile, introduced the use of sterile rubber gloves in the Johns Hopkins Clinic in 1889, not to prevent hand contamination, but to protect the hands of his competent instrument nurse from the bichloride solution that caused her dermatitis. His resident, Bloodgood, was the first to wear gloves in that clinic, four years before Halsted adopted them in operating and made it mandatory for his surgical team. Mrs. Randers-Pehrson shows that Halsted was not the first surgeon to use gloves in operating. However, it should be said that he exerted more influence than any other surgeon in demonstrating the necessity of wearing sterile rubber gloves to prevent hand contamination of the operative wound.

The author also gives a detailed story of the making of the earlier gloves, made from urinary bladders and the cecum of animals, as well as the evolution of the rubber glove itself.

Altogether this short monograph is a detailed and authoritative discussion of the evolution of the surgeon's glove. It should interest every surgeon and should occupy an important place in his books on the history of medicine.

LANCELOT LAW WHYTE. *The Unconscious Before Freud.* New York City, Basic Books, Inc., 1960. xi, 219 pp. $4.50.

Reviewed by ILZA VEITH, *Associate Professor in the History of Medicine, University of Chicago, Chicago 37, Illinois.*

IN spite of its challenging title, this book does not set out to detract from the achievement of Freud. However, in the author's words: "Freud's greatness lies not in any of his particular ideas but in the fact that he compelled the race to face the problem of finding an adequate concept of the unconscious mind. He showed, once and for all, that the unconscious is so powerful that this task cannot be neglected." This statement is the result of Mr. Whyte's studies which convinced him, as others have been convinced before, that the idea of the unconscious mind is not an invention of Freud but a concept held and propounded through centuries by a number of great thinkers. Mr. Whyte refrains from speculation as to whether Freud knew of the earlier ideas on the unconscious. He is, however, emphatic in his statement that the early thinkers are not "predecessors" who "anticipated" Freud, but with him are participants in a growing tradition.

After having thus absolved Freud from the onus of conscious or unconscious plagiarism, Mr. Whyte proceeds to present the "History of Ideas," which forms the basis of his book, and his own definitions of conscious and unconscious. In grappling with these terms, he casually restates his aims by suggesting that it is the development of human self-awareness which is the central theme of his study. He thus seeks references to awareness, or rather the conscious, in the writings of pre-Freudian authors for, according to Whyte, "The discovery of the unconscious by self-conscious man occupied

some two centuries, roughly from 1700-1900." But he hastens to add that while "during these two centuries the *existence* of the unconscious mind was being established; the discovery of its *structure* only began in the twentieth century."

The central and somewhat disproportionately large part of the book furnishes the support of Mr. Whyte's thesis. It deals with "The Discoverers" of awareness and is arranged in four chronological chapters which are largely composed of quotations from the implied and explicit statements on awareness of a vast variety of authors, including mystics, poets, novelists, philosophers, and scientists. Here it is unfortunate that greater emphasis has not been placed on the Romantic Movement and the writings of E. T. A. Hoffmann which have been altogether neglected. The reviewer also misses an attempt at differentiation between the psychological and philosophical concept of the unconscious.

In a brief final chapter, entitled "The Prospect," Mr. Whyte projects further thinking on the unconscious and foresees a lessening of the antithesis of conscious versus unconscious, particularly since "the basic biological function and structural meaning of both terms are still obscure, after many generations of quasi-scientific usage."

Mr. Whyte's book grew out of a lecture series of the Third Programme of the B.B.C. Typical of this medium is the clarity of his presentation but again a certain lack of depth, and perhaps also disregard of some minor inaccuracies, such as the date of Nietzsche's death which occurred in 1900 and not in 1890. To those who have been unaware of the pre-Freudian thought on the unconscious, the book will serve as a welcome introduction; students of the subject will find it a useful summary.

HERBERT THOMS. *Our Obstetric Heritage; the Story of Safe Childbirth.* Hamden, Connecticut, Shoe String Press, 1960. xii, 164 pp., 19 illus. $4.75.

Reviewed by WILLIAM B. OBER, *Director of Laboratories, Knickerbocker Hospital, New York 27, New York.*

THE art of writing a useful book often consists in knowing what to leave out. In this brief account of the development of the obstetric art, Dr. Thoms has aimed at a wide audience. The text is written in non-technical language, but it has the style and assurance of the wise clinician and sound scholar. Any intelligent layman can read this book with pleasure and profit, and indeed any physician who has not studied specially the history of obstetrics will find in it information which he does not have.

Following a brief introduction dealing with obstetrics in primitive societies and ancient cultures, the author devotes a chapter to the role of the midwife. While their historical position is well known, many physicians will be surprised to learn that the first school for nurse-midwives in the

United States was opened in 1932, and Dr. Thoms has supplied us with a brief account of the value of this departure.

The historical narrative is continued through brief accounts of the contributions of Ambroise Paré, Scipione Mercurio, and William Harvey which formed the intellectual and practical background for the scientific advances of such leaders in the 17th and 18th centuries as Van Deventer, Mauriceau, Smellie, and John and William Hunter. The exposition of the development of obstetrical forceps by the Chamberlen family is most lucid. The author has taken great pains to clarify the roles of the three Peters and two Hughs who were the important figures in that ambiguous chapter in obsterical history. Dr. Thoms credits the Chamberlens with being the originators of the forceps, disregarding the evidence from a sculpture of the 2d century A.D. which indicates that such an instrument was known to the Romans. One of the unsolved mysteries is how this useful and life-saving instrument was allowed to disappear from obstetrical practice during the Dark ages.

The chapter on puerperal sepsis is well balanced, giving due credit to Charles White of Manchester and Alexander Gordon of Aberdeen as well as to Oliver Wendell Holmes and Ignaz Semmelweis. Many readers who are unfamilar with the details of the history of the conquest of childbed fever will be surprised to learn that the contributions of White and Gordon were made half a century before the more popularly celebrated Holmes-Meigs controversy and the stormy career of Semmelweis. Somewhat to the regret of this reviewer Dr. Thoms does not mention the contribution of Thomas Watson who from 1836 to 1848 taught that the disease was contagious, being propagated by midwives and accoucheurs. Not only did Watson suggest disinfection of the hands by a weak solution of chlorine, but he also suggested that a thin, pliant glove be developed for use in obstetrical manipulations.

Other chapters include useful and accurate information on the development of cesarian section, the triumph of obstetrical anesthesia, and a number of less dramatic but equally important topics. Selected aspects of obstetrical history in the 19th and 20th centuries both in America and on the Continent round out an admirable and readable book.

Amplifying the text are a number of well-reproduced illustrations. Of particular interest is the photograph of a section of the wall in the temple of Kom-Ombo in Egypt depicting the queen in labor and a variety of obstetrical instruments. One might wish for a reproduction from William Hunter's *Anatomy of the Human Gravid Uterus Exhibited in Figures,* a classic of anatomical delineation which Dr. Thoms justly lauds. However, the loss in reducing these large plates to plates of a 5" x 8" size would be great. At the end of the book is a well-chosen bibliography which will direct the reader to more detailed texts and to historical sources.

RAYMOND N. DOETSCH. *Microbiology: Historical Contributions from 1776 to 1908.* New Brunswick, New Jersey, Rutgers University Press, 1960. xii, 233 pp. $5.00.

Reviewed by DAVID WEINMAN, *Associate Professor of Microbiology, Yale University School of Medicine.*

THIS anthology contains seventeen papers reproduced in part or in whole, all in English and all representing important achievements in the history of bacteriology.

Selection was guided by the decision to proceed "from the question of the origins of microbes (Spallanzani, Schwann, Tyndall) to their role in fermentations (Schwann, Pasteur) to methods for dealing with them in the laboratory (Koch, Ehrlich) and classifying them (Cohn, Orla-Jensen) to a recognition of their importance as biological entities (Lister, Schloesing, Warington, Winogradsky, Burrill, Smith, Beijerinck)."

The title misleads. The book is limited, far more than indicated. The reader will find no contributions on virology, immunology, parasitology, chemotherapy, mycology, animal pathology, insect microbiology, or the many other fields of microbiology.

Anthologizers rarely satisfy all readers. For the present reviewer, this compilation suffers because it provides material for the most part divorced from the present concerns and the perennial problems of microbiology. Conversely, the author has succeeded in his purpose of furnishing "material for a course in the history of general microbiology" (read: bacteriology) and "a supplementary source for the study of a relatively poorly documented branch of biology."

HERBERT THOMS. *The Doctors of Yale College 1702-1815 and the Founding of the Medical Institution.* With Notes, Bibliography, and Index of Names. Hamden, Connecticut, The Shoe String Press, Inc., 1960. xxi, 199 pp., $6.00.

Reviewed by THOMAS R. FORBES, *Associate Professor of Anatomy, Yale University School of Medicine, and Acting Editor of this Journal.*

SEVERAL publications marked the celebration on 28 and 29 October 1960 of the sesquicentennial of the establishment of what is now known as the School of Medicine of Yale University. One of them is Dr. Thoms's important record of the Yale College graduates between 1702 and 1815 who became medical men and of the organization of the Medical Institution. Biographies of 23 of these physicians comprise the greater part of the book. A fascinating and colorful lot they are. As was the custom, the practice of medicine was often combined with other occupations and professions; we find in the group not only men like Eli Todd, Jared Eliot, and Jared Potter, who made their mark primarily as physicians, but also the great lexicog-

rapher, Noah Webster, Oliver Wolcott, a leading patriot of the American Revolution, David Bushnell, developer of the submarine and the submarine torpedo, Benjamin Silliman, scientist, teacher, and editor, and other distinguished figures. Dr. Thoms's careful research, enthusiasm, and easy style have resulted in a lively series of sketches. Good photographs of the portraits and homes of the doctors increase the sense of reality which the author arouses. The story of the founding of the Medical Institution of Yale College is recalled in some detail. There were the problems which usually hinder such a venture, but in October, 1813, when instruction actually began, there existed a complete faculty, over 30 students, and the established support of the parent institution.

The late John Fulton points out in the Foreword that some of "the early cleric-physicians of Yale" were political leaders. Others were inventors, writers, social leaders, agriculturists, scientists, soldiers, philanthropists, and legislators. As one considers these accounts of Yale's first graduates to become doctors and of the founding of its medical school, he is reminded of the physician's privileged opportunity to transcend his private status. His special talents, education, and experience have prepared him also to lead in politics, to teach, to write, to plan. The strictures of long hours and fatigue can be severe, as they were in the 18th century for busy doctors like Jared Eliot and Benjamin Silliman, but some men find time. The challenge of public service still exists for most physicians; new books need to be written, new medical schools to be founded. The examples which Dr. Thoms draws from the past have much meaning for the present.

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The Hôtel-Dieu of Paris on the Eve of the Revolution

PHYLLIS ALLEN RICHMOND*

THE hospitals of Paris, with their wealth and variety of clinical material, were an important factor in the development of clinical teaching of medicine during the latter part of the 18th century. The names, La Salpêtrière, La Pitié, La Charité, the Hôtel-Dieu, and others, are familiar to all historians of medicine. What were these famous hospitals like? A lively hospital reform movement during the reign of Louis XVI has left a very interesting record of existing conditions. While some allowance must be made for exaggeration due to zeal for reform, there is enough agreement among descriptions to provide a good picture of the Parisian hospitals in this period. The Hôtel-Dieu, being the most important *general* hospital, was singled out for special (and extra rigorous) treatment.

I

Contemporary surveys were made on the eve of the Revolution by a Committee of the Academy of Sciences appointed to study the possibility of rebuilding the Hôtel-Dieu, and by Jacques-René Tenon, celebrated surgeon and later anatomist. These showed that Paris had forty-eight hospitals or houses of charity, of which twenty-two were for the sick exclusively, six were for sick and destitute, and twenty for destitute persons or orphans alone. It was estimated that Paris daily took care of 6,236 sick persons, 15,000 foundlings, and 14,105 "valides"—aged people, widows, transients, and orphans.[1] When Louis XVI came to the throne in 1774, the population of Paris was a little over 600,000 but during his reign it increased so rapidly that by 1789 it approached 700,000. In general, hospital facilities were insufficient for such large numbers.

The hospitals of Paris can be classified according to the type of patient received. Some, such as the Hôpital de la Charité and the

* Rush Rhees Library, University of Rochester, Rochester, New York.

1 Tenon, Jacques-René. *Mémoires sur les hôpitaux de Paris.* (Paris, Royez, 1788), pp. 3-16. See also F. Campbell Stewart. *The hospitals and surgeons of Paris.* (New York, J. & H. G. Langley, 1843), p. 53; Bailly, Jean-Sylvain. *Extrait des registres de l'Académie Royale des Sciences du 22 novembre 1786. Rapport des commissaires chargés, par l'Académie, de l'examen du projet d'un nouvel Hôtel-Dieu.* (Paris, Impr. Roy., 1876), pp. 8-9, 11, 63-64.

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military hospitals, took only men. Four small hospitals run by the Dames Hospitalières accepted women only. Hospitals for both sexes included the Hospice du Collège de Chirurgerie, the parish hospitals, and the Hôtel-Dieu. There were also special hospitals for certain diseases. Two branches of the Hôtel-Dieu took epidemic and contagious diseases only: Hôpital St.-Louis and Hôpital Ste.-Anne or de la Santé. All of these hospitals were for the sick alone.

Certain *charitable* institutions also cared for a number of the sick. The most important of these were a group of hospitals making up the municipal institution known as the Hôpital Général de Paris: Notre Dame de la Pitié, La Salpêtrière, Hospice de Bicêtre, Hospice de Vaugirard, and several orphanages. In these institutions care of the sick was only one of many duties performed. As municipal foundations they also served as refuges for the aged, prisons, and asylums for the mentally ill.

The largest *general* hospital in Paris, the Hôtel-Dieu, was supported partly by municipal funds, partly by provincial and national assistance, and partly from private sources. As a municipal institution it received all types of diseases except known cases of scabies, which were sent either to its affiliate, Hôpital St.-Louis, or to the Bicêtre. A *bureau* of leading citizens served as a central administrative board for both the Hôtel-Dieu and the Hôpital Général de Paris. This board included the President and Attorney General of the Parlement de Paris, the Archbishop of Paris (Chairman), the First Presidents of the Treasury and the Court of Requests, the Lieutenant General of Police, and the Provost of the Paris Guilds. There were two councils of laymen under this board, one for the Hôtel-Dieu and one for the Hôpital General. It is interesting to note that, though the councils for the hospitals contained many important governmental officials, there were no physicians included until after the Revolution.[2]

The practical administration of the hospitals of Paris was generally vested in the hands of religious orders, which not only supplied the administrators, but also the nurses. Two of the best

2 McCloy, Shelby T. *Government assistance in eighteenth century France.* (Durham, N. C., Duke University Press, 1946), pp. 190-196. McCloy estimates that 40-50 per cent of the revenue of the Hôtel-Dieu came from endowment, legacies, and gifts, 5-10 per cent from church sources, and the rest from state, provincial, and municipal sources. The public money, in turn, came from taxes, duties, exemptions from certain taxes, fines, lotteries, or grants of money in case of dire need, subsidies for foundlings and soldiers, miscellaneous minor grants—cf. Leon MacAuliffe. *La révolution et les hôpitaux de Paris—années 1789, 1790, 1791.* (Paris, Société Nouvelle de Librairie et d'Édition, 1901), pp. 11, 21.

known nursing orders were the Brothers and Sisters of Charity. The ranks of the latter were frequently augmented by widows and other lay women of good birth. Nursing was at that time regarded as a highly suitable form of social service and not unpleasant, as the menial duties were performed by servants.[3]

The hospitals were largely self-sustaining, and had their own laundries, slaughter-houses, stables, granaries, pharmacies, bakeries, kitchens, and candlemaking establishments. They employed a corps of seamstresses, bookkeepers, officers of health, priests, and other skilled personnel. The medical and surgical service was provided by Parisian physicians and surgeons, many of whom served without compensation. The wealth of different cases, especially in the larger hospitals, offered them a variety of excellent experience.

Most of the patients were extremely poor and were treated without cost. Those who could pay were expected to do so, but as a rule these people were treated at home, and hospital space was reserved for charity cases. In addition to providing hospital care for the sick, the municipal hospitals also had outpatient departments where the poor could receive free medical and surgical consultations, and pharmacies which distributed free medicaments.[4] Theoretically, the poor of Paris had access to adequate medical advice and free medical care if necessary. But although the quality of the doctors was comparatively high, the quality of institutional care had deteriorated to such a point that some of the larger hospitals had become death-traps to which the poor turned only as a last resort. The larger charitable institutions were always crowded and were, of necessity, impersonal in their relations with patients. Administrative routine tended to be considered more important than treating the sick—the end had been swamped by the means. Much criticism was directed against the Hôtel-Dieu in this respect.

The Hôtel-Dieu was a large, rambling building occupying lowlands on both sides of the Seine River near Notre-Dame Cathedral. Two bridges over the river connected its wings, giving the impression of a hollow square. Internally the hospital was arranged in "salles" or wards. These wards were classified roughly according to types of medical conditions, but many strange mixtures were

[3] MacAuliffe (note 2), p. 68; Pierre Jean Georges Cabanis. *Oeuvres complètes.* (Paris, Bossange Frères, 1823-1825). Vol. II. "Observations sur les hôpitaux," pp. 320ff. The personnel were not all of the high calibre of the nurses. Cabanis takes a dim view of the quality of the servants employed, some of whom he believed to be criminals hiding from the police!

[4] McCloy (note 2), pp. 182-189.

tolerated. The administrative offices were on the first floor, and the basement was used for storage of food, wood, oil, wax, and other combustibles. Candlemaking was carried on here, adding to the danger of fire. Two serious fires had occurred in 1737 and 1772. The original hospital building had been erected in medieval times. The corridors were narrow and there were not enough staircases. The rooms were very small, with low ceilings so that with crowded conditions, the air was humid and close, making breathing uncomfortable.[5]

Lack of cleanliness was serious. The bedding was not changed very often, so that new patients were constantly placed in dirty beds. Unwashed linen was used by patient after patient. Filthy feather beds with inadequate covers were taken out and beaten once in a while, but this scarcely solved the cleaning problem. If the patient died, his clothes were sold (without cleaning) by the hospital. Drinking cups and dishes were hastily and improperly washed. Communal latrines were poorly constructed, malodorous, and badly situated.[6]

The Seine River provided drinking water for the hospital and carried away its waste. The inhabitants of Paris who lived along its banks below the hospital feared the transportation of morbid particles, as well they might. In regard to water supplies, however, the Hôtel-Dieu was better off than most of the other Parisian hospitals.

The hospital administration was unimaginative and firmly wedded to its routine. The new patient was often moved five or six times before he was allowed to remain in peace. As a result, treatment and remedies at times became confused. Everyone was fed at the same time, whether his case called for it or not. Everyone was fed the same thing. All remedies were given simultaneously, and no account was taken of individual differences in diseases, or of crises or other critical times.[7] These stupidities contributed to the high mortality rate.

[5] Tenon (note 1), pp. 178-222, *passim;* Rondonneau de La Motte, *Essai historiques sur l'Hôtel-Dieu de Paris.* (Paris, l'Auteur; Nyon aîné, 1787), pp. 239-243; *Rapport* (note 1), pp. 35-36, 41; Coqueau, Claude-Philibert. *Mémoire sur la nécessité de transférer et reconstruire l'Hôtel-Dieu de Paris, suivi d'un projet de translation de cet hôpital, proposé par le Sieur Poyet architecte & contrôleur des batimens de la ville.* (Paris, n.pr., 1785), pp. 2-3, 44 (map I).

[6] Tenon (note 1), pp. 178-300, *passim:* La Motte (note 5), pp. 230-243; *Rapport* (note 1), pp. 41-48.

[7] Coqueau (note 5), p. 7; Cabanis (note 3), vol. II, p. 321. As Cabanis put it: "A l'Hôtel-Dieu, il y a des jours où on purge, il y a des jours où on ne purge pas." This obvious disregard of all scientific spirit in medical treatment of the sick shocked him greatly.

Overcrowding was the chief and basic defect of the Hôtel-Dieu. The hospital had 1,219 beds, large and small, arranged wherever they could be fitted in. As there were usually about 3,500 patients in the hospital at any given time, the sick were placed four, five, or six in the large beds. Eight children could be found in the same bed in the smallpox rooms.

With so many patients in a bed, it was impossible for any of them to relax or to sleep. They could not alter their position to relax their stiff muscles. Sometimes half the bedfellows would get up at night so that the other half could sleep for a while, but this solution was only possible with convalescence or moderate illnesses. The patients were arranged so that the heels of one rested beside the shoulders of the next. Needless to say, there were no blankets or other covering because to keep the feet of one patient warm it would have been necessary to suffocate his neighbors. Fortunately, the heat of fever patients kept their neighbors warm. Babies put in with their mothers were often overlaid and smothered.[8]

Not only were the patients jammed into beds, but they were often indiscriminately mixed as to disease, and the dying and dead with the living. With the exception of smallpox, the patients suffering from all kinds of diseases were placed in the same beds, so that a typhus case might be next one of tuberculosis, or scurvy, or cancer. Convalescents were not separated from the others, and it was often necessary for them to pass through the smallpox wards when going for exercise.[9] Even though the body of medical information at the time did not contain much accurate information about the causes of disease, it was known that some were more contagious than others.

Probably one of the worst results of the crushing was the free and mutual interchange of respective diseases on the part of the patients. Scabies and vermin were universal, and no treatment was

[8] *Rapport* (note 1), pp. 6-7, 20-26. Joseph Townsend, who apparently visited the hospital during a lull, found 2,574 patients, sometimes arranged four in a bed (*A journey through Spain in the years 1786 and 1787*, 2nd ed. London, C. Dilly, 1892, vol. I, p. 35); Tenon estimated that a patient in a large bed received a maximum of 8½ inches of space, whereas at least 18 inches were necessary for comfort ([note 1], pref., pp. xx-xxi).

[9] The situation in regard to diseases is very nicely explained by an anonymous author in a note to his poem, *Un malade de l'Hôtel-Dieu de Paris*. (Paris, 1787), pp. 25-26, note 3: "Ne voit-on pas le jeune homme à côté du viellard, le fièvreux à côté d'un malade affecté d'une fièvre sinogue-putride [probably typhoid or typhus], un phthisique à côté d'un malade atteint d'une fluxion de poitrine, un scorbutique à côté d'un dysscnterique, un convalescent à côté d'un malade à l'agonie?" For other descriptions, see Tenon (note 1), pp. 135, 163; Townsend (note 8), p. 35; *Rapport* (note 1), pp. 13, 20-26; Leon Lallemand, *La révolution et les pauvres*. (Paris, A. Picard, 1898), p. 16; Coqueau (note 5), pp. 4-7. A patient who entered with one disease was sure to emerge with scabies, if nothing worse.

given for either of these two evils. The air was foul, partly as a result of poor ventilation, partly from so many patients all breathing at once, and partly from the unwashed state of both the patients and their linen.

The surgical patients had a particularly hard time at the Hôtel-Dieu. They were placed in the noisiest part of the building, next to the rue de la Boucherie, where heavy carts passed steadily during the daytime. At night the mental patients in the adjoining wards carried on where the carts left off. Simple operations became serious, serious operations were mortal, and the most difficult ones, such as trepanning, never succeeded. This situation was not improved until Pierre Joseph Desault became Chief Surgeon in 1789.

Surgical cases were placed three in a bed, but the beds were poorly arranged and there was constant traffic back and forth of nurses pushing trays of food or carts of linen, and outpatients lined up between the beds to wait for their consultations with the surgeons. The operations took place under the eyes of the other patients, who thus had before them the horrors to which they were soon to be subjected. Those already operated upon were also in the same rooms and were constantly reminded of their agonizing experiences by the sight and sound of others undergoing the same thing. In the days preceding the use of anesthesia this situation must have been particularly ghastly. The close presence of the autopsy room did not render the air or the psychological atmosphere any more salubrious. The final disturbance was a mental one. If the patient happened to be a Protestant or heretic, he was constantly being urged to abjure his religion before it was too late. The hospital kept a record of such conversions.[10]

In the maternity wards the situation was equally bad. Three and four patients in all stages of delivery were placed in one bed. The well were mixed with the sick. Jacques-René Tenon was shocked to find that the illegitimate mothers were indiscriminately mixed with the legitimate ones. The closeness of contact assured an interchange of infections, and great epidemics of puerperal fever raged through the maternity rooms—in fact the disease had

[10] *Rapport* (note 1), p. 48; Cabanis (note 3), vol. II, p. 327; Tenon (note 1), pp. 222-266. The descriptions of the surgical and maternity wards are among the most interesting in Tenon's book. The "Registre des adjurations reçues à l'Hôtel-Dieu de 1693 à 1713" was exhibited at the Paris Pavilion during the Exposition of 1900 (MacAuliffe [note 2], pp. 31-32). This practice may not have continued to 1789, but the practice of not including non-Catholic babies in the birth lists (or death lists) certainly prevailed, and there is little reason to believe that conversions were not made whenever possible.

been endemic for twelve years at the time Tenon wrote (1787). The average maternity patient spent thirty-five days in the hospital, most of the time being needed to recover from secondary infections acquired. Surgical operations performed in the ward were singularly unsuccessful. Out of 3,445 Caesarian sections performed since 1500, only seventy-nine had been successful for the mother. Forceps deliveries were also very hazardous. The mortality rate in this ward[11] was not as high as might be expected, but it was double that of the other Parisian lying-in hospitals.

The mental patients were in a somewhat different position from the others. These were not entirely the poor of Paris. Middle class and wealthy families often sent their mentally disturbed members to the Hôtel-Dieu because they lacked the means or place to keep them at home. Unfortunately, only twenty-six beds were reserved for such cases and they were crowded together like the rest. Unlike the physically ill patients, who were often too sick to move, the mentally ill were constantly shouting, battling, and creating disturbances which made the occupants of the neighboring rooms miserable. Hydrophobia cases were placed in the mental ward, and the constant noise as well as the sight of water provoked their horrible convulsions. Separate institutions were urgently needed for mental diseases.[12] Though the mortality rate of such at the Hôtel-Dieu was not high, conditions were obviously not conducive to recovery. It should be noted that the mentally ill were treated as sick people, not as criminals or sinners as in many other countries at that time.

The figures upon which the mortality rates of the Hôtel-Dieu were based were extremely scanty. The rate of admission for the first day of each month was recorded and the rest of the days were omitted. All figures of admissions, therefore, are based on twelve entries per year, disregarding epidemics or other events which may have occurred between registration days. The official registers are untrustworthy as to death rates. The official rate was given as 13 per cent, but Tenon, who had kept his own notes, estimates the rate as more nearly 22 per cent, while during the Revolution the Comité de Mendicité put it at 20 per cent. This was considerably

11 Tenon estimated that the maternal death rate (in childbirth) was 1 in 15⅔, which was low compared with the average for the hospital (1 in 4½), but high compared with other maternity hospitals (1 in 31). Tenon (note 1), "résumé," pp. 342-346; La Motte (note 5), pp. 239-243.

12 Tenon, (note 1) pp. 178-222; *Rapport*, (note 1), p. 38.

higher than the rates of the other Parisian hospitals.[13] The mortality rates for women were higher than those for men, and those for children the highest of all. The difference in rate between the Hôtel-Dieu and La Charité has been shown by a contemporary author who compared the over-all figures. He discovered that in fifty-two years the Hôtel-Dieu had received 1,000,741 patients, of whom 254,532 had died. Ninety-nine thousand of these would have been saved if they had been at La Charité instead.[14] It appeared that France was losing a large proportion of her population unnecessarily.

The outrageous conditions at the Hôtel-Dieu were a challenge to enlightened humanitarians. Such callous treatment of the poor aroused their fighting instincts, and a mass of schemes and projects for reform appeared. It is notable that while the other hospitals of Paris came in for criticism on individual points, most of the abuse was directed towards the Hôtel-Dieu, mainly because this was the most important hospital among the public institutions.

II

Some attention had been given to conditions at the Parisian hospitals before Louis XVI ascended the throne in 1774. Claude-Humbert Piarron de Chamousset, Maître Ordinaire of the Chambre des Comptes of Paris, had outlined the bad conditions at the Hôtel-Dieu in 1757, pointing out that six miserable creatures in a bed, abandoned to nature and the compassion of spectators, had little chance of recovery. Chamousset was not an idle critic. He had turned his own house into a model hospital for the poor, hired physicians to staff it, and provided a pharmacy to give out free medicines. Now he wanted to reform other hospitals, particularly the Hôtel-Dieu, along the same lines. He made many suggestions for the improvement of administration and service, but nothing came of them.[15]

[13] The figures from the Comité de Mendicité are given in MacAuliffe (note 2), p. 231; in the *Rapport* (note 1), pp. 63-64, 77-78, 81, the following figures are given:

Hôtel-Dieu	1 in 4.356
La Charité	1 in 7.500
Necker	1 in 6.401

These figures were issued by the institutions themselves, with the exception of the Hôtel-Dieu. La Charité and Necker apologized for their high death rates by explaining that people often died on their doorsteps or soon after arriving because masters had a tendency to bring their dying servants to the hospital instead of allowing them to die at home. The high mortality rate in the Hôtel-Dieu might have been partially caused by this practice.

[14] Anonymous (note 9), p. viii.

[15] La Motte (note 5), pp. 186-189; Tenon (note 1), pp. iii-iv. Chamousset devoted a patrimony of 500,000 livres to charitable works.

In 1772 there was a very bad fire at the Hôtel-Dieu and many patients were burned to death. This tragedy aroused public indignation. The idea of moving the hospital to the Ile des Cygnes, first suggested in 1737 by Turgot, who later became Louis XVI's first Contrôleur Général des Finances, was now revived by several interested architects. It should be noted that at this point in the hospital reform movement the reformers were mostly architects, and their plans, of course, consisted of suggestions for handsome new buildings.[16]

In consequence of the flurry of attention aroused by the fire, Louis XV, in 1773, issued Letters Patent dividing the Hôtel-Dieu into two establishments. The present Hôtel-Dieu on the edge of the Seine was to be razed and a new building built. The design of the King was opposed by the religious orders in charge of the hospital on the grounds that the twenty-five million livres to be appropriated was not enough to make the new hospital any better than the old one had been. The Parlement de Paris, however, overrode the opposition and revived the hopes of those who wanted to see the end of the old Hôtel-Dieu. The death of Louis XV postponed the project.[17] The coming of Louis XVI to the throne had been followed shortly by the re-establishment of the Courts of Justice, and his interest in hospital reform led to the hope that the Parlement de Paris would carry out the innovations approved by his predecessor. But the government was extremely slow in acting upon the suggested reforms, and in the meantime other memoirs appeared, mostly from architects as before.[18]

In a rather unfortunate blunder, Louis XVI drastically intensified the hospital situation, in July, 1777, by issuing an ordinance which called for the incarceration in houses of detention of all indigent men of any age who had no means of support and no trade. Vagabonds and beggers were condemned to the gallows. Thus the King thought to solve the problem of extreme poverty

16 La Motte (note 5), pp. 193, 207-208, 211-212; Tenon (note 1), pp. v-vi; *Rapport* (note 1), pp. 89-90; Ferdinand Dreyfus, *Un philanthrope d'autrefois: La Rochefoucauld-Liancourt, 1747-1827*. (Paris, Plon-Nourrit, 1903), 139, 141; MacAuliffe (note 2), p. 67. The architects included Caqué, Regnier (former Director of the Hôpital Militaire), Pierre Panseron (Professor of Design at the École Militaire), C. N. Chalgrin, and J. F. T. Ledoux ("Architectes des batimens de la ville"). Abbé Nicholas Baudeau, humanitarian, and Abbé A. H. Tessier, agriculturist, were also interested in hospital reform.

17 La Motte (note 5), pp. 209-211.

18 La Motte (note 5), p. 207; Tenon (note 1), pp. vi-vii; Dreyfus (note 16), p. 45, tells of a visit to the Bicêtre made by Lamoignon de Malesherbes and the young Duc de la Rochefoucault-Liancourt in 1774. The former was a follower of Turgot, the latter of Necker and Abbé Baudeau. In 1774, the architects, Antoine Petit and Prunneau de Monlouis, made suggestions for reforming the hospitals. Jean Baptiste Leroy, a physician and member of the Académie, also had a plan.

by abolishing or incarcerating the poorest members of the population. The ruling made overcrowding in the charitable institutions worse than ever. Up to this time no attempt had been made to raze the Hôtel-Dieu as ordered in 1773, and, in fact, the buildings destroyed by the fire of 1772 had been rebuilt in case it was decided not to move the hospital after all.[19] Louis XVI's ordinance may have been issued with the best of intentions, but it could scarcely have alleviated the pressure on an already overburdened public charity.

The hospital situation had become so noticeably bad by this time that a royal investigating commission was appointed in 1777. This commission studied the situation carefully, concentrating on the Hôtel-Dieu, and then submitted a report, on the basis of which the Royal Edict of 1780 and the Letters Patent of 1781 were issued. Under the Edict, certain suggested financial reforms were made, and the hospitals were permitted to sell their real estate in order to use the proceeds for operating expenses, payment of debts, and new construction. Though the King was zealous, he was unwilling to use force to see that the Edict was carried out, and it remained dormant. The Letters Patent of 1781 settled some administrative problems at the Hôtel-Dieu, demanded that only one sick person be placed in a bed, and that different diseases be confined in separate rooms. The hospital was in no position to carry out this order unless it had a new building, or small beds to replace the large ones, or both. Therefore the order was not carried out.[20]

At the instigation of Madame Necker, "la mère des pauvres," who had visited the Hôtel-Dieu and had been horrified by what she saw there, a new hospital was founded in the largest parish in Paris. The government contributed one hundred twenty beds to this Hospice de la Paroisse St.-Sulpice et Gros-Caillou, later called Hôpital Necker in honor of its patroness, and it was formally opened in 1779. Through rigid economy this hospital was able to function at a much lower cost than the Hôtel-Dieu. The reformers were disappointed that this model institution, which carefully fol-

[19] MacAuliffe (note 2), p. 6; La Motte (note 5), p. 215.

[20] La Motte (note 5), pp. 213-215; *Rapport* (note 1), p. 9; Lallemand (note 9), p. 17. The Committee members consisted of the administrative heads of the Hôtel-Dieu and the Hôspital Général, two Councillors of State, the Director of the Société Royale de Médecine, the Master of Requests, and three parish curés. Louis XVI's Letters Patent of 1781 were based on the supposition that the existing Hôtel-Dieu could be arranged in such a fashion as to handle 3,000 patients at the rate of one per bed, with enough space saved for 1,000 extra patients in time of epidemics! Evidently he had never seen the Hôtel-Dieu.

lowed the rules of hygiene of the day, should have had such a high death rate.[21]

Up to 1785 the reform movement had been a comparatively mild and leisurely affair. Philanthropists and architects had made suggestions, and some of them had actually put their ideas into effect by founding private hospitals where the poor were treated gratuitously. At this stage scientists and physicians appear to have ignored the movement. The King, however, had been impressed by it and had appointed a committee to study the hospital situation. The committee had taken several years to do this, and then had submitted a report calling for drastic changes in the Hôtel-Dieu, which were embodied in the decrees of 1780 and 1881. The orders of the King, however, were not carried out, and the situation remained as bad as before.

III

The years 1785 to 1789 saw the publication of many pleas for reform, varying from objective essays to immoderate poems. Whereas up to this point architects and philanthropists had held the lead in the reform movement, now the scientists and the *philosophes* took up the battle. In 1777, when the first royal committee of inspection had been appointed by the King, M. Dulaurens, a military physician, had had the idea of investigating the hospital situation for himself. He received permission from the Archbishop of Paris, but the administrators of the municipal hospitals would not admit him and he felt compelled to give up the project. Several years later, encouraged by the fact that there had been another investigating committee appointed by the King, and when Tenon told him that he was working on a similar project, Dulaurens decided to resume work and bring out his own views on the subject. His *Essai* took the form of a discussion of the ideal hospital, and it is interesting to see what sort of things he stressed.

He discussed the location of a hospital, what size it should be, its proper ventilation, the type of furniture it should contain, the administration of a hospital, its pharmacies, the medical staff (officers of health, physicians, surgeons, apothecaries), the type of nurses, rules for service, the need for serious medical inspection,

[21] Lallemand (note 9), pp. 18-19; McCloy (note 2), pp. 196-197; Dreyfus (note 16), p. 139; other hospitals founded in this period included the Hôpital du Midi, for certain cases of venereal diseases, and the parish hospitals, Hospice de la Charité de la Paroisse de St.-André-des-Arts founded by Desbois de Rochefort, and Hospice de la Paroisse de St.-Jacques de Haut-Pas (Hôpital Cochin) founded by Jacques-Denis Cochin. None of these hospitals was large enough to relieve the pressure on the municipal institutions.

the chaplains and their functions, and finally, the improvement of medical schools and why they should be attached to hospitals. His most interesting contribution was a plan for improved clinical records. He published a copy of one of the charts actually used at the Parisian hospitals side by side with a new one which he had worked out. The actual chart had a list of beds, with the numbers all confused, and a place for the medicaments and diet opposite the name of each bed. There was also a space to enter the date on which the patient died, but none to mark when he had recovered, which was a rather significant omission. Dulauren's chart had ten columns in which the following entries could be made:

number of bed (in correct order)
name and rank of sick person
day of entry
details of illness
medicaments
diet
observations (this could include death, recovery, peculiar conditions of the disease, etc.)
particular orders to be followed
number of baths
number of purges[22]

Such a chart would make it easier to give each patient the type of care his case required. At the same time it would supply vital statistics and medical records, which would be of continued assistance in social and medical research. Reform of hospital records was not effected until the early years of the French Revolution.

The second phase of the reform movement was vastly stimulated by a little book put out in 1785 by two architects, Claude-Philibert Coqueau and Bernard Poyet, *Mémoire sur la nécessité de transférer et reconstruire l'Hôtel-Dieu de Paris, suivi d'un projet de translation de cet hôpital, proposé par le Sieur POYET, architecte & contrôleur des batimens de la ville.*[23] The *Mémoire* was written in two parts. The first half was a long argument on

22 M. Dulaurens. *Essai sur les établissements nécessaires et les dispendieux pour rendre le service des malades dans les hôpitaux vraiment utile à l'humanité.* (Paris, Royez, 1787), *passim*. Charts on p. 90. Dulaurens also wrote three other books on hospital conditions, cf. *Biographie universelle*, vol. XI. Up to the time this essay was written it was customary at the Hôtel-Dieu for an incoming patient to be given an armband with the date and his name. If he died, the armband was returned to the registrar and the death noted in the register (MacAuliffe (note 2), pp. 67-68).

23 Coqueau also wrote *Essai sur établissement des hôpitaux dans les grandes villes*, (Paris, Desenne, 1787), a work favoring secularization of hospital administration. Some contemporaries, notably Bailly and La Motte, consider that Coqueau wrote the whole of the *Mémoire*. Tenon and Baron von Grimm attribute the first half "sans nom d'auteur" to Coqueau and the project itself to Poyet. Examination of the book itself and the form of its title bear out the latter interpretation. Coqueau was employed by Poyet at the time the book was written.

the bad location of the Hôtel-Dieu. The second part gave Poyet's plan for a 5,000-bed hospital, consisting of two circular buildings, one inside the other, connected by enlarged corridors, so that the whole had the appearance of a spoked wheel with a hollow hub. The spaces between the "spokes" were designed as court-yards and a chapel was to stand in the central court at the hub. Water was supplied to the hospital by means of an aqueduct running underneath it. Two lazarets for contagious diseases were separated from the main building. The hospital was to be composed of three floors, with the offices, kitchens, pharmacies, and other necessary agencies on the first floor.[24]

The plan of Poyet received much attention.[25] Popular enthusiasm grew to such a pitch that Louis XVI was once more compelled to take notice. He asked the Academy of Sciences to appoint a committee to examine the hospital situation and make recommendations in the light of this plan.[26] The Royal Committee was duly appointed and began its work with enthusiasm. The report issued by this Committee was one of the most significant publications of the reform movement. The Committee consisted of J. Sylvain Bailly (Chairman), Jacques-René Tenon, M.D., Matthieu Tillet, agronomist, Jean D'Arcet and Louis-Jean-Marie Daubenton, naturalists, Antoine-Laurent Lavoisier, chemist, Charles Auguste de Coulomb, physicist, Pierre Simon de La Place, astronomer and physicist, and Joseph-Marie-François de Lassone, M.D. Both Tenon and Lassone had been connected with the Hôtel-Dieu in a medical capacity. The group presented its findings in November, 1786. The report, which was lucidly written by Bailly, is extremely interesting. It echoes the 18th century humanitarianism and reflects the keen interest of the members of the Academy in the problem of hospital reform.[27]

[24] *Mémoire sur la nécessité*, pp. 1-30 (Coqueau), pp. 30-44 (Poyet).

[25] *Relevé des principales erreurs contenues dans le mémoire relatif à la translation de l'Hôtel-Dieu, et examen du projet du Sieur Poyet, qui est à la suite.* (Paris, 1785); *Rapport* (note 1) pp. 18-19, 92; La Motte (note 5), p. 234; Coqueau, Claude-Philibert. *Supplément au Mémoire sur la nécessité de transférer l'Hôtel-Dieu de Paris, au Analyse du relevé des principales erreurs contenues dans cet ouvrage.* (Paris, Desenne, 1786).

[26] Grimm, Friedrich Melchior, Freiherr von. *Correspondance littéraire, philosophique et critique par Grimm, Diderot, Raynal, Meister,* etc. Maurice Tourneux, ed. (Paris, Garnier Frères, 1877-1882) vol. XIV, pp. 297-300; Dreyfus (note 16), pp. 140-141; Condorcet "Mémoires sur les hôpitaux," Dupont de Nemours, "Idées sur les secours à donner aux pauvres malades," cf. Henry E. Guerlac, "Science and war in the *Ancien Régime*," Harvard Ph.D. thesis, 1941, vol. II, p. 278n.

[27] La Motte (note 5), pp. 235-245; *Rapport* (note 1), pp. 1-5; Maury, Alfred. *Les académies d'autrefois: l'ancienne Académie des Sciences,* 2d ed. (Paris, Didier, 1864) p. 309; Saigey, Émile. *Les sciences au XVIII^e siècle; la physique de Voltaire.* (Paris, G. Baillière, 1873) vol. II, Appendix I. Baron von Grimm called the *Rapport* "un des plus parfaits modèles que l'on puisse citer dans ce genre" (note 26), vol. XIV, p. 530.

The Commissioners first asked the basic questions: "Was the Hôtel-Dieu adequate for the City of Paris? Was it large enough and healthful? Was it suitable for the poor who had to use it for a refuge?" In order to answer these questions they took into consideration the reports of various reformers who had already written about hospital conditions, and then they visited the hospitals themselves. They went to La Salpêtrière, La Charité, the Hospice de Saint-Sulpice, and the Hôtel-Royal des Invalides. At these institutions they examined all aspects and conditions, and came to the conclusion that they were all worthy of approval. Then the Commissioners wished to visit the Hôtel-Dieu, the main object of their mission. The management of this hospital, evidently fearing the worst, refused to admit them, although they had secured permission from the Archbishop of Paris and the First President of the Council. The power of the administrators is clearly seen in this action, by which even a royal investigating commission could be turned away. At this point, the Committee members were discouraged and feared that they would have to abandon their investigation. Tenon saved the day by producing figures and observations which he had kept over a long period of association with the hospital. These figures were supplemented by information gleaned from the annual reports contributed by the Hôtel-Dieu to the statistical record. *État des baptêmes, des naissances, & des morts de la ville et des faubourgs de Paris,* which ran from 1720 to 1785. These figures, as Tenon was to show in detail in his own ***Mémoires sur les hôpitaux,*** were not altogether satisfactory because the hospital only entered data for the first day of each month, and thus completely omitted details for epidemic periods unless they happened to coincide with the day reported. The reformers assumed that the reason for this skimpy reporting on the part of the hospital administrators was their diligence in attempting to cover up the true mortality rates. Actually, it is more than likely that they were tied to an obsolete statistical system and lacked both the inclination and the initiative to change. Under repeated attacks from the reformers, the administrators appear to have developed considerable sensitivity about the subject, and this, taken in conjunction with the constant criticism of hospital conditions, may explain the refusal to admit the Commissioners.

The Committee of the Academy of Sciences, using Tenon's figures, came to the conclusion that the Hôtel-Dieu was insufficient in accommodations for the needs of Paris and dangerous to the

health of its patients. Suggestions for improvements included separate beds for each patient, larger buildings spread out on ample grounds (this meant a new location for the hospital), beds of iron with linen mattresses, one-story buildings, separation of different kinds of diseases, and precautions against fire. After settling the matter of the Hôtel-Dieu, the Commissioners took up Poyet's plan. When they had duly considered it, they determined to reject it and instead suggested four new hospitals, each capable of handling twelve hundred patients, to be built at four extremities of Paris. To save unnecessary construction, they thought that these new institutions should make use of the existing Hôpital St.-Louis, after modifications, the Hôpital Ste.-Anne, after enlargements, and the building of the Convent des Célestins. The fourth hospital should be a new building located near the École Militaire, but not on the Ile des Cygnes. The old Hôtel-Dieu should not be torn down, but kept for emergency illness and accidents.[28]

The consequences of this report were far-reaching. The hospital reform movement, which up to now had been a rather quiet affair, became widespread in the years following its publication. There was considerable circulation of translations of English books on hospitals, the best known being John Howard's *État des prisons, des hôpitaux, et des maisons de force,* a good description of bad conditions from a distinctly humanitarian viewpoint.[29] Humanitarians visited the hospitals (they seem to have had no difficulty getting in!) and some wrote descriptions and appeals based on their visits. Rondonneau de La Motte inserted a poem, written by an anonymous author and directed towards the wealthy, in his *Essai historique sur l'Hôtel-Dieu de Paris:*

> Venez & pénétrez dans cet public asyle,
> de douleurs, du misère effrayante domicile;
> c'est ici qu'une avare & dure charité
> fait haïr les secours de l'hospitalité.
> Bravez, pour un moment, l'air empesté qu'exhale
> de ce réduit impur la vapeur sépulchrale.
> Quel amas de souffrans en troupeau rassemblés!
> Voyez sur un seul lit confusément mêlés,
> celui que la douleur tient sous sa dent cruelle,
> celui qu'à la santé l'espérance rappelle,
> celui dont le cadavre est en proie à la mort,
> celui qui se débat contre elle avec affort.

[28] *Rapport* (note 1), pp. 26-35, 246-247, 85-88, 97-208.

[29] Howard, John. *État des prisons, des hôpitaux et des maisons de force. Traduire d'anglois.* (Paris, Lagrange, 1788) 2 vols. This is a translation of his *State of prisons in England and Wales, with preliminary observations and an account of some foreign prisons and hospitals.* (Warrington, 1777).

> Si votre sein encore enferme un coeur sensible,
> qu'il indigne & frémisse à ce spectacle horrible,
> elevez un asyle à tant de malheureux
> honorable pour vous, salutaire pour eux;
> & que l'humanité, souffrante & misérable.
> loin d'un gouffre infecté, trouve un port secourable.[30]

In similar humanitarian vein, Dulaurens had dedicated his *Essai* "aux amis de l'humanité":

> Ames honnêtes et sensibles, c'est à vous qu'est dû l'hommage de cet écrit: son but étant le soulangement des malades indigens et la perfection de l'art de guérir, qui tend à la conservation des hommes, il mérite votre attention. Les moyens qu'il présente, étant opposés à des usages et à des opinions que le tems et l'autorité ont consacrés, votre appui lui est nécessaire pour le succès.[31]

It is notable that he, like many reformers, believed himself to be facing almost insuperable odds when dealing with the current practice and authority. Evidently pressure for change must come from outside, little being expected from either the hospital administration or the medical profession. Further research is needed on this aspect of the reform movement. Were the apprehensions of these writers justified? Possibly their appeals were overemphatic, but there was a definite need for an aroused public opinion if the hospital reform movement was to be successful. At any rate, the literary reformers took the official report and reduced it to terms readily grasped by laymen.

The *Rapport* of the Academy of Sciences was accepted by Louis XVI. The Royal Council issued an *arrêt* on 22 June 1787, authorizing the collection of subscriptions and a lottery for the purpose of raising money for the four new hospitals. The subscription met its goal easily and 1,200,000 livres were raised by the lottery, but the hard-pressed government used most of the money for other purposes, and no new hospitals were finished. In 1789 demolition of large parts of the buildings of the Hôpital Ste.-Anne was begun, and Poyet was put in charge of the construction of the new hospital which was to replace it. This appears to have been the only tangible results of the four new hospitals scheme.[32]

After contributing facts and figures regarding the Hôtel-Dieu to the Committee of the Academy of Sciences, Tenon decided to put all his material together in a general survey of the Paris hos-

30 La Motte (note 5), pp. 238-239.
31 Dulaurens (note 22), preface.
32 Lallemand (note 9), pp. 319-320; McCloy (note 2), p. 194. A list of subscribers is given in La Motte (note 5), p. iii.

pitals. This memorable piece of work was written in 1787 and published the following year. It easily ranks with the work of John Howard as one of the more influential reform documents of the later 18th century, and Tenon's enduring fame rests upon it as much as upon his medical researches. The *Mémoires sur les hôpitaux de Paris* was submitted to the Academy of Sciences, and, as a result, Tenon was sent to England to study the hospitals there. He was in the midst of this survey when the Revolution broke out, and he abandoned his work in order to return to France and serve in the National Assembly as Deputy from Seine-et-Oise. After his retirement from political life in 1793, he worked on anatomical and medical studies, leaving the hospital reform problem for the new government to solve.

In the *Mémoires,* Tenon systematically examined each hospital in Paris as to buildings, furniture, sick people, service, and regulations. He paid particular attention to the volume of air available for each patient and to the size and situation of rooms and corridors. His evidence as to the conditions in the Hôtel-Dieu was the most damning presented by any of the reformers, especially as the report was written in an objective and scientific manner, with a minimum of reference to the humanitarian motives which characterized other descriptions. Many of the other reformers had written flattering appeals to Louis XVI to remedy the situation, but Tenon merely presented the facts and figures, and largely confined his commentary to pointing out their horrid significance.

Tenon's exposé of the terrible conditions at the Hôtel-Dieu made a tremendous impression, and was cited long afterwards whenever enthusiasm for reform was aroused. His survey left little doubt as to the situation in the Paris hospitals. The next step was to act upon the information and remedy conditions wherever necessary. In the 1780's, Necker, who was Contrôleur Général des Finances, had planned to put 2,500 single beds and 500 double beds with partitions into the Hôtel-Dieu as an experiment, and to build some new buildings adjacent to the present hospital. The project was held up by a technicality—the hospital authorities demanded wider beds. Evidently some agreement was reached because the first new beds were added in 1787, shortly before Tenon's book was published. Tenon admitted in his preface that some improvement had been made in the Hôtel-Dieu after his description had been written, but he maintained that for the most part conditions were still bad. The maternity patients had been

moved from the second to the third floor, but now they were placed next to the smallpox patients in low rooms, not at all isolated from each other. The changes, he believed, did not fundamentally alter the basic difficulties of bad location and poor architecture.[33] Nevertheless, in spite of Tenon, there must have been a great improvement in the crowded situation, particularly with regard to beds.

IV

One important development in medicine appeared before the Revolution, probably promoted by the hospital reform movement. This was the beginning of use of hospitals as teaching institutions. Some medical reformers were much interested in the idea of giving medical students the type of practical knowledge which could be obtained at the bedside. Cabanis pointed out that bedside teaching was used at Edinburgh, then the center of medical education, and at Vienna. The medical clinic for teaching purposes was introduced into France by Louis Desbois de Rochefort, a member of the staff at La Charité, in 1780. In 1788, after his death, this method of teaching was revived and expanded at La Charité by J. N. Corvisart, later famous for his work on the heart. Pierre Joseph Desault, Chief Surgeon of the Hôtel-Dieu, inaugurated a clinic and a system of bedside teaching at this hospital in 1787. His method involved having his students take the case histories of the patients, make the clinical notes on the cases, witness surgical operations which were performed in an amphitheater as nowadays, and take part in dissections, particularly ones made for purposes of pathological study.[34] The wide adoption of the method of clinical and bedside teaching during the Revolutionary period and after was an important factor in the ultimate supremacy of France in the field of medical education during the first half of the 19th century.

Aside from the developments in medical education and a few scattered improvements in the Paris hospitals, the reform movement was not a success. Those reformers who had placed their hopes in Louis XVI had unfortunately leaned on a reed. Though the King issued orders designed to improve conditions by abandoning the old Hôtel-Dieu and building four new hospitals, these orders were not carried out. The financial position of the government was extremely precarious, so that it appeared to be practically

[33] Tenon (note 1), p. lvii; McCloy (note 2), pp. 196-197.

[34] Cabanis (note 3), vol. II, pp. 343-347; MacAuliffe (note 2), pp. 74-87; McCloy (note 2), p. 182; Dulaurens (note 22), pp. 117-158.

paralyzed when confronted by new demands and new emergencies. The Chef du Conseil des Finances, Loménie de Brienne, found it necessary to divert the funds so readily raised for two new hospitals to cover ordinary expenses. The bad winter of 1788 put the finishing touches on the situation. Thousands were starving; mendicity increased by leaps and bounds, and the governmental assistance programs were unable to cope with the great emergency.[35] This failure, on top of all the other governmental difficulties, added up to make a problem too big for the monarchy to solve. Beginning with the Estates General in 1789, representative bodies undertook reform of the whole governmental system, including the public hospitals.[36]

The reasons for the failure of the movement to improve the Paris hospitals are fairly easy to ascertain. Certainly the financial block, a reflection of the weakness of the monarchy, was the greatest impediment. A widespread and deep-rooted humanitarianism, which could have yielded more concrete results, was unable to make itself felt because, up to 1789, there were no significant channels of representative government. Moreover, in a country on the verge of revolution, the hospital situation was only one of a number of factors involved—in this case, a relatively minor factor.

As to the Hôtel-Dieu, it has survived down to the present day. During the period of the Revolution and through much of the 19th century, the hospital continued to be criticized severely, though gradually unhygienic conditions were eliminated. Many parts of the hospital have gone, but the old building on the Ile de la Cité still stands. It is still used as a hospital, mute proof of that latent strength in organization which enabled the institution to weather the storms which surrounded it for such a long time.

[35] The revenues of the hospitals had been reduced from a high point of 2,800,225 livres in 1770 to a low of less than a million livres in 1788. (McCloy [note 2], p. 189).

[36] For an interesting account of these developments, see George Rosen, "Hospitals, medical care and social policy in the French Revolution," *Bull. Hist. Med.*, 1956, *30*, 124-149.

Beccari of Bologna

The Discoverer of Vegetable Protein*

ELIOT F. BEACH**

THE name of Iacopo Bartolomeo Beccari, Italian philosopher, physician, and scientist, has been all but forgotten by modern nutritionists and biochemists. He was born late in the 17th century and his work, published entirely in Latin in the first half of the 18th century, lies under a layer of dust which threatens to deepen further as the accelerating pace of scientific discovery leaves us less time for looking backward. Beccari merits special honor, for it was he who found that wheat flour contains a protein component, gluten. Thereby he first revealed that the chemical principle, hitherto thought to be a component only of animal substances, was, in fact, also present in vegetable matters. From our vantage point the contribution may seem small indeed, but at the time it furnished a catalytic notion upon which others could advance the slowly growing knowledge of protein chemistry and physiology. It showed the source from which herbivores might draw their so-called "animal principle" that Mulder subsequently designated "protein."[22] Thus Beccari forged the vital idea which became a main support of such mighty theoretical structures as Boussingault's "Economie Rural"[15] and Liebig's "Tierchemie."[19]

There are present in each age those who begrudge ancient scientists honor for piddling discoveries, for they say the poverty of knowledge in those days was such that every point at which the spade was sunk must surely have yielded pure gold. But there is no more cogent reason for a study of the history of science than to free the mind of this fallacy. History teaches that the field of undiscovered fact remains today, and will be tomorrow, as fruitful as ever. No amount of progress, however small, has ever been won except at the cost of devoted effort. The abyss of ignorance has been and endures as man's most challenging opponent, and each small victory is a tangible miracle.

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Beccari of Bologna has had no recent biographer principally because of the language barrier. In Italy Latin remained even longer than elsewhere in Europe the language of scholars. Not until a decade after Beccari's death in 1766 were the Commentaries of the Institute of Sciences and Arts of Bologna and its Academy published in the vulgar tongue. It is these Commentaries which contain virtually all of Beccari's published work.

The present paper has a threefold purpose: first to offer an account of the few facts known about the life of this significant person; secondly, to review some of his work on the chemistry of food and drink, confining ourselves to this single facet of the many scientific interests which occupied his fertile mind, and thirdly, by quoting from his learned discourses, to obtain a glimpse of the intellectual and scientific climate which prevailed in that strangely elaborate rococo age which was at once more innocent, and certainly more spiritual, and in some ways gentler than our own.

Part I. The Life of Beccari

The home of Beccari was Bologna, that busy commercial capital in northern Italy, center of one of the Papal States, being the seat of the Archepiscopal See of Emilia, renowned for Giovani's beautiful bronze statute of Neptune, Raphael's painting of St. Cecilia, and for its great University, as well as for its manufacture of sausages, maccaroni, and liquors. Here on 25 July 1682, at a time when the Baroque age was at its zenith, he was born to Romeo and Flaminia-Vittoria Beccari, described as being "of respectable middle-class condition," and was given the name Iacopo Bartolomeo. Like most boys of that day the little Iacopo was entrusted for his early studies to the Jesuit fathers who were quick to appreciate the bright-eyed child with his lively intelligence, quick memory, and curiosity about the world and all its learning. Latin verse was his specialty, and at a tender age he was invited to read some of his own compositions publicly. This training was the foundation for a fluency in the classic language to which his scientific writings later would bear such eloquent testimony. When not yet fifteen, the lad began his study of philosophical systems with the University of Bologna's foremost professor of the subject, Lelio Trionfetti. Philosophy was still under the severely restricting yoke of the ancient scholastics, so it is not to be doubted that Trionfetti's simultaneous interests in botany and natural history were more potent in shaping the boy's mind for his future study than was the philosophical discipline. Iacopo studied natural history,

physics, and chemistry and, since medicine was then generally considered a logical part of any scientific career, he undertook this also. The youthful Beccari selected as his teacher in medicine a certain Jacopo Sandri, "a very learned student of the great Malpighi," who in accord with the then accepted practice, operated his own private school under the aegis of the University. Thus it developed that at age 22 Beccari was decorated with doctorates in both philosophy and medicine.

Beccari's association with Sandri was a chance event of greatest import to the young man's career. Sandri was "impressed with the genius of Beccari who, though very young, had a readiness and astonishing vigor." So it was that this young man was given the honor of membership in a newly formed society, the *Inquieti* or Restless Ones which met at Sandri's home. The society, as we shall see, "formed the wholesome and fruitful germ from which emerged one of the principal academies of Europe, the Academy of Science of Bologna," where Beccari worked and taught all his life. The biographer Michele Medici[21] tells of the earliest papers given by Beccari to this learned body. The first was a scholarly account of the nature of the attractive forces between electrically charged bodies. The second was a paper on the nature of fire in which the English Mayow's new theory of so-called "nitro-ether" was vigorously assailed. It was this theory, further developed over the next few decades through the celebrated studies of Cavendish, Priestley, Scheele, Berthollet, and Lavoisier, which resulted in our knowledge of oxygen. In this matter we find our young scholar arguing the wrong side of the case, but we are assured "he did it in a most masterful manner." It was his connection with the *Inquieti* which permitted him to form friendships with such savants of his day as Eracleto Manfredi, distinguished in medicine and mathematics, Eracleto's brother Eustachio Manfredi, a noted geometer, poet, and astronomer, and Gian Battista Morgagni, an early boyhood acquaintance destined to become professor of anatomy at Padua and said to be "the pride and ornament of the University fortunate enough to possess him." The Beccari-Morgagni friendship was lifelong, remaining a warm one when they were octagenarians.

In its early days, the *Inquieti* had, from all accounts, anything but a placid career. Personal rivalries and small politics between members were a source of frequent crises. But one fortunate event occurred when this body was taken under the protection of the aging and wealthy Count Luigi Ferdinando Marsigli who became its guardian angel and furnished it with a meeting place in his

elegant paternal palace. Here it remained until it was annexed some years later as part of the Institute of the Sciences and Arts of Bologna under the new name of the Academy of Science.

Count Marsigli was probably the most colorful character with whom Beccari was ever associated in all his mild life. In fact, the contrast between them is so complete that one cannot resist a digression to tell more about this remarkable person. When Beccari was but a suckling babe, Marsigli was fighting the Moslem Turks for the Austrian Leopold I, Monarch of the Holy Roman Empire, and, being wounded and captured by the Tartars, was sold into slavery to a certain Pasha who was reluctant to let the lad out of his sight a moment and took him on his military expedition. As a consequence, Marsigli saw the siege of Vienna from the wrong side. His escape from his doting master became possible when the old Pasha was poisoned at dinner whereupon Marsigli fell into the hands of two Turks, who exploited his abilities in agricultural pursuits in the cultivation of their farm and held him until he was sold back to his parents for a sizeable ransom. But directly after his release, not having had enough of bloodshed, he set off to help the Christian forces, this time in defending Vienna and in supervising the construction of a bridge over the Danube. He was honored twice by being called to Rome by the Pope to report on the progress of the Christian armies before the war finally ended in 1699 in the peace of Karlowitz.

It was only two years before another war attracted this wandering spirit, this time the War of the Spanish Succession. During this lengthy affair, because a certain stronghold he was helping to defend held out only three days against the enemy, Marsigli was court-martialed together with his commanding general and only by a hair missed his commander's fate of decapitation. It is surprising such a life left this soldier, world traveler, and student of the Orient any leisure moments in which to delve into geography, geology, natural history, and other sciences. Nevertheless, his writings include dissertations on the development of fungi and on the physical history of the sea, and unique personal experience permitted him to write an authoritative book, *The Military State of the Ottoman Empire, Its Progress and Decadence*.[20]

Such were the personal affairs of the man who later succeeded in converting the *Inquieti* into the Academy of Sciences which would so completely shape Beccari's life. Beccari was undoubtedly in the midst of the small politics and machinations in which the Academicians were wont to indulge during this period of change.

There is no account of how much he was concerned in this, but facts are facts and Beccari emerged as the Academy's first president, so he was at least prudent enough to join the strongest faction. This was in the year 1714 when Beccari was 32. He had worked for several years as president of the *Inquieti,* together with its permanent secretary Domenico Maria Gusmano Galeazzi, to hold that society intact. It was said that "they supported it in serenity by their discourses, and by rekindling and knowing how to inspire confidence—through learned and capable dissertations." [21, p. 8] Together they developed a system for preserving the Academy archives in an orderly manner.

About this time, Beccari was giving private courses in philosophy under the approval of the University. As his fame grew, so did the number of auditors and likewise the remuneration. Simultaneously he worked at a constantly growing practice of medicine. When Count Marsigli managed to form the Academy of Sciences and incorporate it as part of the Bologna Institute, he prevailed upon the senators to create for it a chair of experimental physics and to give the position to Beccari. Galeazzi, "a learned man he esteemed and loved," was made his assistant and co-worker. A strong point in Beccari's teaching was his recognition of the value of experiment and demonstration for the students. To this end, the rich treasure of scientific instruments given to the Academy museum by Count Marsigli was of greatest value, and it was said that Beccari "spared no effort nor expense" to construct much new apparatus with the help of Galeazzi who had lately been to Paris and had seen the newest French inventions.

Francesco Maria Zanotti, great scientist philospher and the writer of most of the Bologna Commentaries on Beccari's work, said of Beccari's qualifications for the post of professor of physics: "He had been taught extensively in geometry and in all the philosphical sciences, being as experienced and learned as the greatest savants. He knew so thoroughly the matters of metaphysics, especially those which the princes of the new philosophy, like Descartes, Mellibranche, Leibniz, and others had brought forth, that he was able to explain them in a scholarly way and readily to demonstrate them. But he excelled as well in the knowledge of physics, being ever faultless in his ingenuity of experiment and in his theoretic discourses. And it is a thing which we rarely find, that one man should excel so greatly in two such diverse disciplines." [21, p. 9]

At about this time our scientist discontinued his private teaching of philosophy to accept the chair of medicine at the University. Here so many students flocked to his lectures from all over Italy that one writer said: "It called to mind those times of the greatest glory of the University of Bologna which during the Renaissance of letters and sciences led the whole world as a sanctuary of wisdom." [21, p. 12] His medical practice and consultations grew until he became the veritable "Hippocrates of Bologna," and one can only marvel that he had time for experimental science on such a scale as the voluminous commentaries indicate.

In 1730, after 20 years of his professorship in experimental physics, Beccari asked to be transferred to the recently vacated chair of chemistry. This favor being granted, he now set about the new task with his customary vigor and, with the help of Eraclito Manfredi, he exhibited the same devotion he had previously applied to the museum of physics. He produced and procured the apparatus and instruments required for the teaching of chemistry through experiments and demonstrations. The Bologna Senate, seeing his success in the Institute, called him also to the chair of chemistry at the University, an entirely separate organization. This required his resignation from the University chair in medicine, though he did not discontinue teaching medicine privately. Combining chemistry with medicine led him into experiments in which the two arts were joined, and his biographer Michele Medici says of this union: "In truth, becoming a master of great note, if not the only one, in chemistry, a science then almost new among us, he had many an opportunity to make progress through applying the ideas of this science to various branches of the healing art." [21, p. 13]

By 1738 his medical skill was such that the University of Padua called upon him to accept their chair of medicine. In this invitation we can detect the hand of his lifelong friend Morgagni, then professor of anatomy at Padua. The tempting offer was finally declined for reasons described by his biographer: "His love of his native spot won out in him, and he could not but give heed to the pressing exhortations of senators, the Prefect of Studies, and even Pope Clement XII, the then reigning pontiff urging him not to abandon the University of Bologna." [21, p. 47]

In the Papal State of Bologna, it can be imagined that the regard of the reigning pope would be a thing greatly to be desired. Beccari enjoyed such favor and was close to being invited to Rome. Medici says:

Benedict XIV and the prelate Clement who was his successor did not cease to show him manifestations of esteem and affection. On this subject, it suffices to recall that when his archivist the famous Antonio Leprotti died, he looked to Beccari as successor. And though he did not accomplish his design in this regard, it was because he had to allow for his own best interests, and prove his benevolence for his native city (by leaving Beccari there), preferring to do without this so illustrious physician than to strip Bologna of so noble an ornament. [21, p. 47].

In 1749, Beccari had reached his 67th year, having served as professor for 40 of these. This was more than ample service to qualify him for retirement at pension under the benevolent policies of Pope Benedict. The remarkably energetic career had made the aging scientist a little weary and he decided to resign. But retirement did not mean much of a change in pace, for Beccari was a born teacher and continued to instruct privately for many years. In fact, he was said to have been giving lessons up to five days before his death on the 29th of January 1766 when he was heavy with years, having lived 83 years, 6 months, and 5 days.

Beccari's last will and testament bequeathed his books, manuscripts, physical instruments, and memorabilia to the Institute. In this collection was Marcello Malpighi's microscope with which this distinguished founder of micro-anatomy and predecessor of Beccari had "disclosed all those marvels of organization in plants and animals which were hitherto unknown." Included also were his collections of precious objets d'art and of medals in which fields he was a distinguished amateur. One must assume that Beccari had neither wife nor children, for no mention is made of them by any biographer.

Beccari, the gentle distinguished scientist, was mourned by professors, students, senators, academicians, and friends who laid his mortal dust to rest with sober pomp in a sepulcher in the church of Santa Maria del Baraccano. In June of the year in which he died, a solemn funeral was held for him in the Temple of the Reverend Canons of Sante Salvatore during which a great funeral oration was pronounced. Upon his tomb was engraved the inscription: "Hic requiescit Jacobus Bartholomeus Beccarius—Vir Sapientissimus et Integerrimus." The years lengthening into centuries have proved that fame, like the flesh, is all too mortal, for today this scholar, forgotten by a busy world, dwells among us only in the rich harvest that has sprung from the fertile seed of his labors.

PART II. SOME WORKS OF BECCARI

During a long productive life, Beccari made two major contributions which have stood the test of two centuries. The first was his discovery of protein as a component of vegetable substances. The second, less known today, was his finding that silver salts are photosensitive, undergoing color change on exposure to light, an observation which entitles him to distinction as a founder of photography. It is interesting that both of these useful achievements were by-products of larger studies rather than being directly in the main stream of his research. Nor is it these successes which reveal the true measure of the man and the vigor of his intellectual life in contrast to his placid physical existence. Only by perusal of his varied and prolific works does one grasp the wide scope of matters he strove to make subject to his understanding, or the insatiable appetite of that ever-curious mind for the things of nature "which God in His infinite wisdom and mercy had prepared for His Creation." Of all men's efforts, the rare successes, be they ever so illuminating, show less about man's essential human nature than do his less spectacular gropings in the twilight of ignorance, his hard-earned failures and his numerous trivial reports. Beccari's works include great medical consultations,[4] as well as dissertations on anatomy, the phosphorescent phenomena in many natural substances[1] including diamonds,[12] the bioluminescense of mollusks,[11] the power of light to fade colors and to produce photochemical reactions,[14] *ignis fatuus* or will-o'-the-wisp,[17] meteorological data, observations on the aurora borealis,[13] dissolution of solids,[8] molecular motion in liquids,[6] the physical geography of his native country-side and the chemistry of sand deposits around Bologna.[5]

The fertile area of work in food chemistry and nutrition took up much of Beccari's time, and it is to this that we must restrict our attention here. Five major publications on this subject appear in the Commentaries of the Academy of Sciences and Arts of the Institute of Bologna, hereinafter referred to as the Bologna Commentaries. Extensive direct quotation from them will permit Beccari to give his own account.

1. *De frumento*

This article of prime significance "On Wheat" appeared in the *Bologna Commentaries* of 1745,[9] being a condensation of a discourse given before the Academicians by Beccari in 1728. It was written not by his hand but by that of the Secretary of the In-

stitute, although we have every reason to believe the commentary follows in large measure the wording of the original.

The introduction tells something of the existing concept of nutrition as well as the fact that men, then as now, were surprised that there still remained new things to discover. Here too we find the idea that the human body is the dwelling place of an immortal spirit, for in those days the exact sciences and social welfare had not yet brought enough enlightenment to discredit this belief entirely.

> *Haec, quae cibi caussa sumuntur, . . .* Of those things which are taken by way of food, if there be some who wish to know about these, surely they may be best guided, it seems to me, by the oracle of Apollo, which instructed that one should know himself. For, if we consider the body, omitting the immortal and divine spirit, what else is there save the thing we feed? Certainly the Greeks, and the Romans, and the Arabians, and those who with greatest eminence followed them, namely the Gauls and the Italians, have engaged in describing the natural function of foods. So much of this sort of study has been done, that although we must marvel at their notable observations, it must be wondered the more that there remained anything they did not observe. Therefore to discover anything new in the matter of food is remarkable. [9, p. 122]

Beccari separated gluten from wheaten flour in this way:

> *Res est parvi laboris . . .* It is a thing of little labor. Flour is taken of the best wheat, moderately ground, the bran not passing through the sieve, for it is necessary that this be fully purged away, so that all traces of a mixture have been removed. Then it is mixed with pure water and kneaded. What is left by this procedure, washing clarifies. Water carries off with itself all it is able to dissolve, the rest remains untouched. After this, what the water leaves is worked in the hands, and pressed upon in the water that has stayed. Slowly it is drawn together in a doughy mass, and beyond what is possible to be believed, tenacious, a remarkable sort of glue, and suited to many uses; and what is especially worthy of note, it cannot any longer be mixed with water. The other particles, which water carries away with itself, for some time float and render the water milky; but after a while they are carried to the bottom and sink; nor in any way do they adhere to each other; but like powder they return upward on the lightest contact. Nothing is more like this than starch, or rather this truly is starch. And these are manifestly the two sorts of bodies which Beccari displayed through having done the work of a chemist and he distinguished them by their names, one being appropriately called glutinous and the other amylaceous. [9, p. 123]

It was one thing to have prepared gluten, but quite another correctly to identify it. At this point the technical ingenuity of Beccari comes into bold relief, for he recognized gluten as an "animal substance" in contrast to starch a typical "vegetable substance." His methods of proof were as follows:

In digestionibus, quas lenis et diuturnus calor facit, . . . During digestions produced by mild and prolonged warmth, animal substances are never brought to a true fermentation but always putrify frightfully. Vegetable matters ferment as if by their own accord, and never putrify except where art is applied; and among these manifestations of fermenting it is outstanding that they show signs of sourness which are never found with animal matters. When fermentation is caused, vegetable materials produce vinous and acetic liquid; animal materials, when they putrify, yield urinaceous ones. . . . The glutinous part of wheat yields no indication of acidity, within a few days it becomes foul, it is disintegrated, most stinkingly it putrifies, after the manner of a cadaver; what is putrified becomes liquid and is dispersed upward into the water; a little blackish material remains in the bottom, most fitly to be described as corrupted meat. The amylaceous matter indeed gives off first an acid which I do not know; at last it becomes vinous as the odor and taste lessen, which it imparts to the supernatant liquid. Certainly this thing is not at all inclined to putrifying, but rather is tenacious of this acid; indeed, though Beccari during more than 20 days held it in a warm condition, it kept a sourish taste and odor; even entire and uncorrupt. [9, p. 123]

Further evidence of the animal and vegetable nature of these two fractions of wheat was obtained by destructive distillation of them. In Beccari's retort there arose from gluten a "urinaceous spirit" and from starch an "acid spirit" after the fashion of "digestion in mild heat." Beccari tried several other grains also, but none yielded "animal matter" in his hands. However, he had discovered an important link in the chain of events in the over-all nitrogen cycle. His discovery in vegetable substance of what later would be called protein showed that plants in fact can form "animal materials" which herbivorous animals may then use directly* in the construction of their own tissues.

2. *De iuribus variis*

The way in which Beccari applied the art of chemistry to the solving of problems in medicine and nutrition is nowhere better shown than in a report, "On Various Broths"[7] in the *Bologna Commentaries*. The work, undertaken in 1722 with the assistance of his fellow academician, Guiseppi Monti, was designed as a chemical study of the soups and broths in common use for feeding the sick. Although many physicians used soups made from different meats with quite shocking lack of discrimination, the great Valsalva, then president of the Academy, said: "At times there occur between them [broths] differences, which are rather fickle as regards detection through the senses, but which are far from inconsequential in the treatment of disease, which differences, if they are

*It is of interest that this idea was put forward a century later by Berzelius.[22]

neglected, shall certainly disappoint the hopes of physicians." [7, p. 95] Therefore observations were made on broths prepared from river crabs caught in the full of the moon, lobsters of good plumpness, the torso and hips of the green frog, tortoises, bullocks, and, of course, the snake. This last was believed by many, in accordance with Boerhaave's teachings, to be especially "useful against disease and for strengthening the inner organs." The broths were compared as regards color, odor, flavor, transparency, and specific gravity which was determined by the use of "the hydrostatic machine and the light balance." Acidity or alkalinity was measured by the use of a certain indicator which Beccari mentions frequently in his work, "syrup of violets." (*Syrupus violarum.*) This turned green in alkali and red or purple in acid. The types of precipitates obtained with certain strong and weak acids and bases were described in detail. Of special importance was the quantitative estimate of the gelatin contained in each variety of meat stock. Beccari explained the superior medicinal virtues of snake broth on the basis of its chemical characteristics, among which its high content of gelatin was especially outstanding. He says of it: "This broth was evaporated to one half volume and it formed a sort of obscure jelly, greenish and clear and of the pleasantest taste. . . . Snake broth far excels all others in repelling diseases of the skin and in adding to the perspiration. . . . It rouses up vapors excreted by the skin, nourishes the strength and to the lean it will bring plumpness." [7, p. 102]

The method by which Beccari explains how the gelatin in broth accomplishes its remarkable medicinal feat is impressive in its complexity if in nothing else.

His rebus sibi facile persuadet Beccarius, vim omnem viperarum ad cutis vitia emendanda, . . . By these things Beccari easily convinced himself, that all the strength of snakes, to correct skin blemishes and to assist in transpiration, resides in that gelatinous substance, which as we have seen above is extracted from them; this indeed increases the gelatinous parts of the blood, and thins it more, and thus sets the skin in order; and this one of all the other things stands out, that it increases perspiration and cures the skin. What one exceeds all the rest in this thing? Why certainly it is the gelatinous matter in the snake that does it. For as soon as it has been mixed with blood, it is not possible but that it will increase the gelatinous component thereof, which being increased, supplies ample material for perspiration. And for the cause of its gelatin as well as for others it ought to be used; but the snake soup ought to be best of all, for it maintains the serum of the blood somehow more mobile; and it is always the nature of it to be most gentle and mild. It is of this innate quality, that when it is mixed with serum and acted upon by heat the effect is such that the latter becomes more and more attenuated, so that it will pass even the smallest

FIG. 1. Engraving from the Portrait Collection at the New York Academy of Medicine.

FIG. 2. Here embedded in an ornate frame are shown both sides of the commemorative medal struck under commission from ten of Beccari's grateful students by the artist P. Tadolini. The plate etched in copper is said to decorate the first page of Volume I of Beccari's *Consulti medici.*[4] The illustration is taken from Silvestro Baglioni, "La funzione delle papille sensitive della corona glandis. Secondo le osservation di G. B. Beccari (1682-1766)", *Archivo di storia della scienza,* 1925, pp. 28-32.

vessels most expeditiously. And indeed nothing will be easier than that it may escape through the fine canals which are in the skin and that it should pass out through them like vapor; and drive out the blemishes, if these be present. Now, in this way, may all the powers of snake broth be explained. What in fact is easier, than that the vapor is joined to that vital air (*"aura"*) by the gelatin of the snake, that vital air which from the glands of the cerebral cortex by the narrowest channels of the nerves is provided to all members of the body? If this we concede to be, there appears to be no doubt, the manner in which it restores vigor and increases the strength of the body. And this corresponds essentially to the opinions of Boerhaave, in whom the greatest confidence is held. Indeed Boerhaave . . . explained that this "vital ether" pervades the nerves, so that nothing would seem more likely, than that a sort of mellow gentle lymph, and a most tenuous one, is absorbed from the gelatinous substance into the body, where there is derived by the body keenness, purification and vivacity of the highest measure. And likewise the gelatin from the snake is able without difficulty to open the obstructions in the smaller vessels; and setting free all the fickle humor, so that it is expanded and drawn away; thus the body fullness is restored, with all its graceful comeliness. [7, p. 106].

Although it is all too easy for us to feel superior in the presence of such befuddled physiology, we must not be too critical of Beccari who did not possess facts commonly available today. We must always be generous about our forefathers' ignorance in the hope that our successors will overlook our own.

3. *De longa cibi potusque omnis abstinentia*

Of all the voluminous accounts of the works of Beccari, none provides more absorbing historical reading than that published in the 1745 *Bologna Commentaries* under the title, "On the long abstention from all food and drink."[10] This investigation was undertaken at the request of the ruling bishop of Bologna, the Cardinal Prospero Lambertini who, by the time of its publication, had become Pope Benedict XIV. It was a great honor to a devoutly religious scientist to have been in a position of service to so lofty a personage of the Roman Church. The cardinal was interested in the matter of long fasting to determine in how far such feats may be considered miracles; and to this end he sought the advice of the best scientific minds of his day. We cannot but admire this great Prince of the Roman Church for his enlightened approach. Beccari's report was incorporated in Lambertini's greatest written work, *De Servorum Dei*[18] which still regulates the rites of beatification and canonization. Of this remarkable Pope it was said:[16] "He sought recreation in the society of learned men and artists among whom he shone as a wit and scholar. Gay, lively and talkative, his conversation at times amazed if it did not shock the staid sensibili-

ties of some of the dignified courtiers who came in contact with him. Mild and gracious in demeanour to all who approached him, the Pope was at times lacking neither in energy nor spirit. . . . All agreed that he spoke well and wittily, and his jokes and *bon mots* were the delight of Rome." This was the character of Pope Benedict XIV whom conservative churchmen criticized for his readiness to compromise with the secular spirit of the age, a patron of the sciences and the man to whom Voltaire admiringly dedicated his "Mohamet."

The assignment of the task of investigating long fasting came about in this way:

Prosper Lambertinus, antequam ad summum pontificatum eveheretur . . . Prospero Lambertini, before he had been elevated to the highest pontifical office, being in Bologna and holding the seat of bishop, wrote books concerning the entering of persons into the Blessed Company of the Saints, in which both the religious ritual by which it is accomplished, and out of what evidences of merit persons could be considered, as well as the whole basis for these consecrations he clearly and copiously explained. But it is a prime requirement in this matter that no one shall be counted a saint, save that he has first accomplished a miracle. When Lambertini had come to this point he wished natural philosophers to be participants in his studies, for however much a matter is to be considered miraculous, the need for prudent judgment is the greater. Moreover these things which are said to be miracles, which be above the power of nature, if scientists, as is widely claimed, describe all the actions of nature and her powers, whatever thing has been postulated as miraculous may be more readily evaluated, as to whether it falls within the limitations of nature, or rises above that which may possibly proceed from nature, and is therefore to be counted a miracle . . . and to pertain to the Saints and to the Glory of God . . . and the prudence of this judgment will be the more secure. . . . He (Lambertini) had this problem at hand, for it was said by many that they were able to abstain from all food and drink for a long time, and he strongly desired to know whether this should be held a miracle, and since many of the early fathers found such a notion repugnant, he hungered to learn whether the judgment (of such churchmen) was consistent with the newer science. He instructed, therefore, the academy to make a full investigation and to write it. The academy commissioned the undertaking to two excellent men, Bazani and Beccari; but since Bazani became affected with a disease of the mind, he was not able to turn to this thing, and thus the whole work had to be undertaken by Beccari, as if it had been commissioned to him alone. [10, p. 221].

The paper contains many accounts of long fasting in animals and men which Beccari knew of from personal observation or through reliable sources. For example, he relates:

Norimbergensis virgo, domesticis odiis exagitata. . . . A maid of Nuremberg, having been tormented by domestic strife, hid herself in the topmost place of a building and there continued without food and drink for 18

days, except that in the 16th day she undertook to lick up a morsel of bread moistened with water. This has been related to us by Helvigius, and he added, that the maid had become thinner in appearance and presented the condition of a mixture of warmth and dryness.

Now this is not greatly different from an account of four men taken from the English Transactions; these were mining coal, then a great vein of water was struck by chance and by this suddenly bursting out, they were blocked off, and they retreated in wretchedness to a higher inner part of the corridor. Here they were for 24 days without any thing for the sustaining of life except water bubbling forth from a little spring, which water when examined by the most skillful chemists, was seen to contain scarcely any sort of lime so that it could have availed nothing, and appeared to have been insufficient for any nourishment. . . . Nor is there any doubt among the learned men of science and those trained in the things of medicine, but that men remain in health and good strength through fasting beyond what the vulgar would think possible. [10, p. 223].

Beccari was convinced that individuals might endure fasts of almost unlimited length and certain of his theories as to how this might be, consistent as they were with the best opinion of his day, now seem incredible. Among the most unique of his ideas was that air alone could suffice for nourishment, of which he says:

Versantur in aere quod nemo quisquam post Boerhaavium ignorat. . . . Their attention was directed toward air, since no one at all after Boerhaave is unaware of the innumerable particles of all sorts of earth, water and fire, many spirits, seeds of either plants or animals, certain salts, oils, sulfur, and volatile matters of all original primordia which are of such weight, that if they should all of them be drawn out of the air, nothing further would be required; and in this way it repeatedly has been said the weight of air makes itself manifest. Moreover it is hardly possible to doubt that the animal body draws this air to itself through the openings in the skin, which was accepted by Hippocrates and confirmed by Galen and lately has gained universal assent. Thus in truth, whosoever shall concede this, will be very near to accepting that animals eat air!" [10, p. 230].

On the other hand, Beccari's concept of body fat as an energy store does little violence to present views, and he states it with a piquant grace rarely permitted in modern writing:

Pinguitudinem in animante quovis maximum praesidium esse. . . . Fatness in any living thing whatsoever is the greatest protection in tolerating the lack of food. . . . These fats during fasting go back into the blood, and wandering to the whole body they nourish the parts, and this Iacobus Perrault thought to be the cause why the Alpine mice have been given by nature not one layer of fat but rather three or sometimes four; so that when for long they live in hiding, being brought to the narrowest restriction in food, they have in the fat layers so much the more from which to be nourished. Which fatness, probably in fact excels all the white humor that is in the body . . . and if necessity requires, being concocted gradually, it is able to be mutated to serum and this becomes nourishment. [10, p. 230].

By devious reasonings, both valid and invalid, Beccari arrived at a sound conclusion on fasting, and this was most fortunate indeed, for in turn it became a part of that important pronouncement of the Cardinal Lambertini which has since regulated certain ecclesiastical matters important to the Roman Church:

> *Etenim clarissimarum inediarum historias Beccarius legens. . . .* And, in fact, reading accounts of the most renowned fastings, Beccari found none in which the subject did not very greatly decline. And this indeed was common to all of them, that they had virtually no fecal dejections, and of the blocking of perspiration they presented most manifest signs; and they were for the most part motionless, languid, inactive, much given to sleeping, torpid of senses, not a few with palsied members, and perturbations of the mind. There are thus in these protracted fasts signs which reveal that the loss of substances has been held to a minimum, and if we accept these losses to have been so restricted, then that it is possible to sustain a long fast shall not be an opinion alien to the fact. . . . Thus he explains fastings as being possible, and all of them appear to have a physical basis so that of themselves none should be held miraculous, nor may they be recommended as such regardless of place, time, type of person or other condition. [10, p. 229].

4. *De medicatis recobarii aquis*

Beccari was ever mindful of the useful service which chemistry could render to medicine. In 1775 the *Bologna Commentaries* contained among its opuscula one written by Beccari's own hand under the title, "On the Medicinal Waters of Mount Recobari."[2] This famous spring not far from Padua, which flows even today, produces water of which Beccari said, "Nothing may be brought forward which is more beneficial and healthful than the natural product of this fountain, or that physicians could declare more suited to the arts of medicine." [2, p. 374] His extensive study divides naturally into two parts, examination of the various solids obtained on evaporation of the water and a consideration of the dissolved gas. Although the whole work seems to explain little of the medicinal virtues of the water, the extensive chemical investigation is admirable and also reveals the best methods of the "chemical art" in the mid-18th century.

Iron was identified in the "first sediment" by the use of the magnet and by the reaction of ferric iron with gallic acid to yield a black solution, this last being a time-honored method of making black ink.

> Indeed the magnet was of greatest elegance, this being used first because of the many indications of its ferrous properties. The magnet did not attract any of this ochre. However the ochre was found to be attracted

after it had been heated to incandescence in a fusing vessel. The edge (of the magnet) being placed in this, it draws beautiful masses adhering tenaciously to the ends. Thus the ferrous nature of the original sediment is revealed only after having been heated. . . . Spirit of vitriol was poured upon the ochre. The effusant liquid upon being mixed with a decoction of nut galls, having been blood red, the beautiful clarity changed to an opaque black, a not inferior sort of ink, which fact confirms that in this ochre some iron lies hidden. [2, p. 376].

The sense of taste, the form of crystals and their consistency were important among the analytical tools used. Of the "second sediment" he said:

We tried the taste. It was found to be mildly bitter, and not dissimilar to that flavor commonly exhibited by water in which a little "salis anglici" (Epsom salt?) has been dissolved. . . . The sediment appears as minute granules, which adhere mutually on contact. They may be ground together easily with the teeth, and in the grinding they do not give a cracking sound. [2, p. 379].

Chloride was detected with silver nitrate:

The absence of marine salt was seen by this sign, that when spirit of nitre, in which silver has been dissolved, was added, no turbidity was produced in the water. This is really a very rare thing in medicinal waters; there are to be found very few indeed, which are free of the least touch of marine salt. [p. 380].

Microscopic examination of crystal form was a common procedure.

Twenty drops, or a little more, were poured out on a glass plate and exposed to the warmth of the sun and the blowing wind, so that by gentle evaporation, those things which might solidify would be yielded in so far as it is possible in a form consistent with their nature. The crust appeared under the microscope disposed in leaves or arranged in tiny scales. . . . These in turn were seen to be united by the slenderest fibrils. . . . They most beautifully resemble little fans which are used by women. [2, p. 382].

Sulfur was discovered in the "third sediment" by reducing the sulfate salt with charcoal to obtain sulfides and sulfur:

The whole mixtures were placed in vessels for fusion; the vessels and mixtures were heated to redness. After this they softened, and the bottom could be seen; then immediately powdered charcoal was placed thereon. It burned at the top without delay. Meanwhile the added powder swells up and with the flashing of sparks it is blown apart; the lightest of flames like those from candles are seen to flit about the burning material. From this the odor of sulfur sharply attacking the nostrils is manifest. . . . When they were dissolved they exhaled an unpleasant and loathsome odor, which resembled that commonly given forth by "liver of sulfur" (hepar sulphure.) [2, p. 387].

Beccari succeeded in identifying the principal dissolved matter in Recobari water as Glauber's salt, the term used in 1755 for sodium sulfate, for he says it contained "vitriolic spirit and the base of marine salt." His clear grasp of the nature of salts is shown in the statement that the crystals are composed of "vitriolic acid, present in abundance, which is held concealed within the hiding places of the earthy base."

The effervescent quality of Recobari water intrigued all who worked with it, and no small portion of its medicinal virtues was attributed thereto. At the time the sediments were under examination, Beccari was fortunate enough to secure from a "vendor of drugs" at the spring, three flagons of the water. These flagons were cleverly devised so that much of the effervescence was preserved despite the 12-day journey to Bologna:

> The vessels being opened, we tasted the water in each. . . . And Gallus, who recently had tasted the waters at the spring, affirmed that the taste of these, which to us as we have said, seemed quite sharp, he said was really mellow by comparison with that other and that they could not with any justice be said to be comparable. This of a truth is not surprising, for in fact there was a lapse of twelve days between the filling of the vessels and the making of these observations; and the water, brief though the space of time might seem, would hardly be able to retain all its strength so long, especially considering the agitation and other vicissitudes of transportation. Certainly this very sharpness of taste produced the not mild suspicion that a part of the native spirit had nevertheless been retained in the water. [2, p. 391].

Beccari found that not all of the gas, variously referred to by him as the "compressible substance," the "native spirit," the "elastic principle," could be removed by a single period of agitation, for when the water was allowed to stand a little time, more could be driven off with shaking. Thus it appeared to Beccari that the gas was held in some form other than simple solution. The complex principles by which carbon dioxide is held in equilibrium in a solution of alkali carbonates and other salts were totally unknown to him, and though baffled by it he showed moments of rare insight.

> The elastic matter of the waters does not come out entirely at once, nor when it is entirely removed, is it exhaled all at the same time. . . . Thus it was when the waters were shaken at first, since it was able to drive off such a quantity of compressible or elastic corpuscles, that the binding of the rest was facilitated. . . . Then when given more time, another host of elastic particles collected anew in the liquid . . . and again if shaken these were impelled to escape. [2, p. 393].

Beccari recognized the gaseous nature of the "elastic principle" and was interested in its taste:

> The taste of the water resides, in some part, in this spirit, which it carries with it on emerging forth from the earth, and then lying concealed within the water, it does not all fly out immediately. . . . I intend to make public that the elastic matter contained in Recobarius water is not different, we have discovered, from that produced from other famous springs. This in fact is air, which I really dare not limit it to, or some other thing similar to air, in part bound with other elements and in a state of uncertain solution. [2, p. 392].

Beccari also found that the elastic principle could be completely suppressed by adding alkali to the water and in this way its acidic nature was appreciated.

Beccari's long, and for that day, brilliant studies on the mineral water are summarized by him as follows:

> *Atque hic fuit nostrarum observationum finis.* . . . And this was the end of our observations. These are in accordance with what had first been hoped, namely to make evident those elements, from which Recobari water is constituted, and this it will be seen, for the most part, has been accomplished. . . . There is in Recobari water, a principle which among the others holds first place, a certain subtle spirit, which possess a compressible strength of great distinction which is clearly associated with its sharp taste, which sharpness certainly if it is like any other sort, will be found most like vitriol. . . . Nor are these waters less abundant in respect to iron, or in a salt whose components include the ferric principle. Moreover not a little alkaline earths are concealed therein, which largely because of its concretions we call selenitic salt following the usage of the most renowned authorities. [10, p. 403].

5. *De lacte*

At the very sunset of life, Beccari produced a final opus "On milk"[3] which, because of delay in publication, appeared posthumously in 1767. This was written by his own hand. The paper is principally concerned with the examination of milk, milk serum. and casein during their destructive distillation in the retort. From the milk serum he obtained only acidic distillates. At that date it was known that milk contains a certain sort of sugar, for he says of milk serum:

> *Humore omni, qui blando ejusmodi calore abigi potuit, exhalato,* . . . All of the moisture, which could be driven off by this mild heat having been expelled, there was a mass which remained at the bottom of the vessel, which some call sugar of milk, having been led to use this name most likely by the sweet taste, which seems to resemble sugar itself. [3, p. 4].

One is not surprised to learn that casein gave evidence in the retort of containing "animal principle" by yielding an alkaline or urinaceous distillate. The white vapor, he said, deposited solid branching crystals adherent to the walls of the receiving vessel, and this he classed as an alkaline salt.

More interesting, perhaps, in this discourse is the digression from the main subject in which he reports further experiments on the gluten of wheat. These observations which were of "incomparable interest" to him he says were "owed to the diligence and dexterity of Jacobo Zanoni," his fellow coworker and academician. They discovered the fact well known today that varieties of wheat differ in their content of gluten:

At de frumenti glutine hoc fidenter possum asserere, . . . And of the gluten of wheat this confidently may be claimed, that a fixed and determined amount is contained in wheat; this does not vary in a single type of flour, no matter what method is employed in the preparation of the gluten. . . . From each kind of flour he (Zanoni) determined the quantity of gluten which it gave off, and from each different amounts were obtained. It was greatest in that wheat which is plentifully available, which our people call *marzolinus*; the least is given by that wheat, which is commonly called *acciarine;* an average amount is given by the common variety. [3, p. 7].

From the vantage point of many years' work in varied fields, Beccari was able to evaluate his work on food and drink, and from these he received his greatest satisfaction. To those in every age who devote their lives to food and nutrition studies he gives from his considered philosophy this encouraging statement:

Quamvis enim nulla sit cognito, a qua emolumentum aliquod sperari tandem non possit. . . . However, in fact, nothing is discovered which does not have some expectation of being rewarded; nevertheless it appears that this hope will be much more certain, as well as more easily attained, if the thing which be submitted to investigation, shall be associated with the conveniences and common enjoyments of living. Because this has been deeply impressed upon my mind, not a small part of my chemical labors have been, where possible, consumed upon that which nature has provided for the sustenance of mortal man, and for the guarding of his well-being. And thus many things, which are taken as food, and which protect human health, or which are soothing or enjoyable, I have endeavored to examine, and this I believe not undiligently. Therefore grains, soups of various sorts and especially those which the physicians use frequently in their treatments, and wines of diverse nature, and all such things have formed a very large part of my disquisitions. Very plainly I was constrained to do this, I opined, since such work has been approved by the most outstanding of men. For certainly there are not wanting among them those who discussed publicly the matter of victuals. [3, p. 1].

There can be no more fitting close to this account of Beccari's work than his last published words in the discourse on milk:

Verum de his hodierno die satis. . . . Truly of this there has been enough for today. Surely there remains for us much more to be said about these subjects, such as the coagulation of milk, of the glutens of grains and other things of specifically vegetable character, and the origin of alkaline salts from them, as well as to be able to demonstrate the conversion of certain of their vegetable liquors into the substance of animals; all these matters, I say, will in the future give us an opportunity, if God in His great goodness shall grant me strength, and we shall have occasion for further philosophy and discoursing. [3, p. 8].

But God, ever so great though his goodness may be, could not be constrained beyond a certain point to grant this grace. Beccari's philosophy and discoursings were hushed and largely forgotten after he was gathered to his eternal sleep.

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Robert Fludd and the Circulation of the Blood

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WILLIAM Harvey's discovery of the circulation of the blood ranks as one of the greatest achievements of the Scientific Revolution. However, in recent years Walter Pagel has pointed out that the word "circulation" had more than one meaning for the scholars of the late 16th and early 17th centuries.[1] Andrea Cesalpino, Caspar Hofmann, and others prior to Harvey had considered the path of the blood to be analogous to a chemical circulation or the process of refluxing in the "pelican."[2] Simultaneously, Giordano Bruno had suggested the circulation of the blood for purely philosophical reasons. He felt that man as the microcosm in this way exhibited the divine circularity of the great world.[3] Harvey primarily meant by the circulation the flow of the blood in its entirety around the body as it is understood today. He based this theory for the first time on experimental evidence and he strengthened his conclusions by his famed if crude calculation of the quantity of blood expelled from the heart in a given time—an approach which paralleled the contemporary application of mathematical methods to other fields of investigation.[4]

These three concepts of circulation may also be found in the works of Robert Fludd (1574-1637), one of Harvey's colleagues in the Royal College of Physicians. These two men knew of each other's work, and it has been pointed out by Pagel that Fludd was

* University of Chicago, Chicago, Illinois. This study was completed during the tenure of a joint Social Science Research Council and Fulbright fellowship at University College, London (1959-1960), and a Fels Fund fellowship at Harvard University the following year.

1 See Walter Pagel, "Harvey and the purpose of the circulation," *Isis*, 1951, *42*, 22-38; Walter Pagel, "Giordano Bruno: The philosophy of circles and the circular movement of the blood," *J. Hist. Med.*, 1951, *6*, 116-124; Walter Pagel, "The philosophy of circles—Cesalpino-Harvey. A penultimate assessment," *J. Hist. Med.*, 1957, *12*, 140-157.

2 Pagel, *Isis*, p. 25. Pagel, *J. Hist. Med.*, 1957, pp. 150-151.

3 Pagel, *J. Hist. Med.*, 1951, pp. 119-120. For the earlier history of this concept see Pagel, *J. Hist. Med.*, 1957, pp. 140-143.

4 Walter Pagel, "The position of Harvey and Van Helmont in the history of European thought," *J. Hist. Med.*, 1958, *13*, 186-188. For Harvey's mystical views on the circulation see Pagel, *Isis*, p. 28, or William Harvey, *The circulation of the blood and other writings* (London, Everyman ed., 1952), p. 56.

the first to give a favorable reference to Harvey.[5] But in contrast to him, Fludd's primary interest in regard to the blood flow was to establish the circulation on metaphysical grounds. He had set forth a mystical doctrine of the circulation as early as 1623, and he later turned also to experimental evidence as a basis for some of his views related to this problem. This may be seen best in his uncompromising attitude against the intraventricular pores in his controversy with Pierre Gassendi who upheld the Galenical position.

It is this somewhat complicated controversy which is the main subject of the present paper. Its main result is to show that no clear-cut distinction can be made between Fludd the mystical alchemist and Gassendi the experimentalist. Although his works are filled with mystical schemes expressed in occult terms and often "proven" with erroneous applications of the experimental method, here, nevertheless, Fludd appears progressive not only in his rejection of the intraventricular pores, but also in his insistence that the arterial blood differs from the venous blood primarily because it contains a vital aetherial spirit closely associated with saltpetre. Gassendi on the other hand, although rightly condemning Fludd's mystical outlook, shows himself as the defender of the Galenical system both in his emphasis on these pores and also in his assertion that the two bloods are basically the same—a point on which he and Harvey agreed.

A. Fludd and the Mystical Circulation

It was due to Father Mersenne that this Fludd-Gassendi exchange occurred. From the period of his earliest publications Mersenne had attacked the then rising school of mystical alchemists, and in his lengthy commentary on the book of Genesis (Paris, 1623) he had specifically singled out Fludd for attack since the latter's system of the world was to a large extent based on his alchemical interpretation of the creation. In his *La Verité des Sciences* (Paris, 1625) he had offered another attack on the alchemists,[6] to which Fludd replied in two works published at Frankfort

[5] Walter Pagel, "Religious motives in the medical biology of the 17th century," *Bull. Hist. Med.*, 1935, *3*, 277-278. For Harvey on Fludd see *William Harvey's De motu locali animalium 1627*. Edited, translated, and introduced by Gwenneth Whitteredge (Cambridge, 1959), p. 95. For Fludd's references to Harvey see his *Pulsus* (Frankfort, 1631?), p. 11, and his *Clavis philosophiae et alchymiae Fluddanae, sive Roberti Fluddi armigeri, et medicinae doctoris, ad epistolicam Petri Gassendi theologi exercitationem responsum* (Frankfort, 1631), pp. 34ff. Fludd's references are discussed in more detail in this study.

[6] Robert Lenoble, *Mersenne ou la naissance du mécanisme* (Paris, 1943), pp. 134-153.

in 1629.[7] As might have been expected, neither of these men convinced his opponent. But Mersenne was not a biologist and he seems to have very little interest in biological topics.[8] Fludd as a physician had illustrated much of his work with biological examples, and Mersenne may have felt that he could not answer his opponent's views satisfactorily. As he was most interested in keeping his correspondents informed of the latest news on all topics in the sciences, he commonly sent copies of recent works to his friends for their comments. We know from a letter that before 2 December 1628 Mersenne had sent a group of Fludd's works to Gassendi for his views concerning them, and along with them he had included a copy of Harvey's *De Motu Cordis*.[9] Gassendi evidently set to work almost immediately on his refutation of the English mystic for his completed work against Fludd is dated 4 February 1629.[10]

It is important for us to consider why Gassendi discussed Harvey's views on the circulation of the blood in connection with his evaluation of Fludd's work. In a marginal reference prior to his discussion of this topic, Gassendi noted the "Anat. trit. lib. 2. c. 1."[11] This is the *Anatomiae Amphitheatrum effigie triplici more et conditione varia* (Frankfort, 1623) by Fludd, a subtitle of which is *De Exacta Alimenti Panis seu Tritici Anatomia.* The second part of this work deals with the spiritual food of the Lord and contains chapters on the mystical functions of the heart and the blood. Although published in 1623, it is dated in the text as having been completed on 9 December 1621.[12] Hence, Fludd's views in this work antedate the publishing of Harvey's book by at least seven years.

The *Anatomiae Amphitheatrum* is divided into two main parts, the first dealing with a standard anatomical description of the body, and the second giving a mystical anatomical description of the heart, the sperm, the blood, and the brain. Fludd then had an opportunity to discuss the function of the heart and the blood in several different places and from several different points of view. In his first anatomical description of the heart he offered an

7 *Sophiae cum moria certamen, In quo, lapis Lydius a falso structore, Fr. Marino Mersenno* (Frankfort, 1629). *Summum bonum* (Frankfort, 1629).

8 Lenoble, *op. cit.*, p. 499n.

9 P. Marin Mersenne, *Correspondance du P. Marin Mersenne*, ed. Cornelius De Waard and René Pintard (Paris, 1932-1955, 4 vols.), vol. II, p. 181.

10 Pierre Gassendi, *Opera omnia* (Florence, 1727, 6 vols.). Includes his *Examen philosophiae Roberti Fluddi medici* in vol. III, pp. 195-245. For this reference see page 243.

11 *Ibid.*, p. 215.

12 Robert Fludd, *Anatomiae amphitheatrum effigie triplici more et conditione varia* (Frankfort, 1623), p. 33.

explanation of that organ and its relation to the blood which in many respects was similar to the system of Galen with the major exception that he made no mention of any function the septum might have in the motion of the blood. Above all, he insisted that the venous system served for bodily nourishment while the arterial system served for the spiritual or vital nourishment of man.[13] In the venous system the blood rises to the vena cava from which it flows into the right cavity of the heart. There the blood is thinned and made lighter so that it might be made more suitable for the nourishment of the lungs. There is no indication in this description that there is a connection between the venous and arterial systems. Hence, the arterial system is treated separately, and he explains that the venous artery (the pulmonary vein) introduces air to the left ventricle of the heart from the lungs. This air which serves for the refrigeration of the arterial blood is then separated in the left ventricle which retains the vital nutritional spirit of the air and expels the superfluous part again through the venous artery during expiration. From the left ventricle the arterial blood is then expelled through the aorta into the arterial network which carries the vital spirits to all parts of the body.[14]

Fludd's second description of the vascular system in this work may be found in his chapter on the mystical anatomy of the heart where he likens the motion of the blood to a series of chemical distillations. The liver is compared to a chemical athanor. Its neck is the vena cava through which the blood is sublimed into the right vessel of the heart which acts then as the receiver or the alembic in the distillation. The right ventricle in turn acts as an athanor of a second order which "circulates" this blood which has already been subjected to one distillation, and then redistills it after it has been thinned and purified into the lungs where it serves as nutriment. In the meantime the arterial system has caused the vital spirit to rise to the brain which serves as a third athanor and this vital spirit is thinned to such a subtlety that it can act upon the intellect. After describing this, Fludd paused to point out "how hateful and worthy of contempt those men are who are accustomed to hold in derision the Alchemists, since a chemist undertakes to do nothing that nature has not already delineated in the human body."[15]

13 *Ibid.*, p. 128.
14 *Ibid.*, pp. 128, 130.
15 *Ibid.*, p. 226. ". . . quam sint illi homines odio & contemptu digni, qui Alchimistas in derisione habere solent, cum verus chimicus nihil aggredi conetur quod natura non in corpore humano delinearit."

This description by Fludd is clearly based on an alchemical foundation. He did not refer to a total circulation of the blood, but he did use the word "circulando" to describe the motion of the blood in the right ventricle. The concept of a Chemical circulation is much more restricted here than it had been by Cesalpino and Hofmann.[16] However, it would appear that this description was not original with Fludd for he simply was repeating the words of Joseph Duchesne in his *Ad Veritatem Hermeticae Medicinae* (Paris, 1604)[17] which had been translated and published in London by Thomas Tymme as the *Practise of Chymicall, and Hermeticall Physicke* in 1605. Here Duchesne had written that

> . . . the same blood being carried into the heart, by the veyne called Vena Caua, which is as it were the Pellican af nature, or the vessel circulatory, is yet more subtily concocted, and obtaineth the forces as it were of quintessence, or of a Sulphurous burning Aquavita, which is the original of natural & unnatural heat. The same Aquavita being carried from hence by the arteries into the Balneum Maris of the braine is there exalted againe, in a wonderful manner by circulations: and is there changed into a spirit truly ethereal and heavenly, from whence the animal spirit proceedeth, the chiefe instrument of the soule. . . .[18]

Fludd described the circulation in an entirely different manner in his chapter on the mystical anatomy of the blood. Here, no longer dealing with plain anatomical description or chemical analogies, he concerned himself with the deeper relationship of the macrocosm and the microcosm. Having proved to his own satisfaction from citations out of Scripture that God placed his tabernacle of the great world in the Sun, he then proved that God placed his tabernacle in man in the heart. Then, relying on the fact that the earth is stationary and the Sun goes around it every day, he pointed out that the Sun as the tabernacle of the Lord affects the four cardinal winds which contain the breath of the Lord —that vital nutriment which is breathed into the body, formed into arterial blood, and then given to the body as that spiritual nourishment without which we would all perish. Hence, the Sun travels around the earth daily in a circle and impresses on the

[16] Pagel, *Isis*, pp. 25-28. Pagel, *J. Hist. Med.*, 1951, pp. 145-150.

[17] Josephus Quercetanus, *Ad veritatem hermeticae medicinae ex Hippocratis veterúmque decretis ac therapeusi* (Paris 1604), 226-227. Nec non idem sanguis per venam cauam in cor usque delatus, qui veluti pelicanus est naturae, aut vas circulatorium, subtilius adhuc cõcoquitur, ut veluti quintae essentiae, aut aquae vitae sulphureae ardẽtis vires assequatur, quae emphyti & symphyti caloris origo est. Eadem per arterias in B. maris cerebri deportata, illic rursum in reti admirabili circulationib. exaltatur; ibique in spiritum verè aethereum ac caelestẽ commulatur unde spiritus nascitur animalis. . . .

[18] For the English translation available to Fludd see Josephus Quercetanus, *The practise of chymicall, and hermeticall physicke, for the preseruation of health,* trans. Th. Timme, Minister (London, 1605), Ch. 15.

winds as well a circular motion. This air which has such a motion impressed on it is breathed by man, and thus the "spirit of life" reaches the heart and from there is carried around the body in a circular motion imitating the divine circularity.[19] This circular motion impressed on the blood relates not only to the spirit of the blood in the heart, but to all of the spirit of the blood in the body. He stated that as the Sun rises in the East, sets in the West, and then hastens to its original position to rise again, so also in the microcosm "does it endeavor to arise anew, and it hastens through the branches of the aorta to the South, that is, the liver, and the North or the spleen."[20]

Fludd's position in regard to the circulation of this spirit may

19, 20 I feel that Fludd's exposition here is extremely important for the determination of his views on the circulation prior to 1628, and consequently I have decided to transcribe the entire paragraph from which these extracts were taken. In the Latin I have underlined the most significant passages. Fludd, *Anatomiae*, p. 266.

Cap. 3. Quod vitae flatus procedat ab oriente tam in macro quam microcosmo, & de metaphysica vitae & animarum utriusque mundi ratione.

Cum igitur cor sit in microcosmo plaga orientalis non aliter quam locus ortus solis, angulus orientalis, horoscopus dictus, sequitur, quod ventus similis ab huiusmodi cardine in homine spiret: atq; hic ventus spirat vitae animam vniuerso spiritui humano, non aliter quam ille macrocosmicus vitã dicitur dare & motum spiritui, seu aeri, seu vento humano. Vnde dicit Sapiens, quod postquam occideret Sol, iterum ad locum suum aspiret, vbi oriatur, properet ad meridiem, & circumeat Aquilonem: Ex quibus verbis liquet, quod Sol, In quo, (iuxta Platonicos) est mundi anima sita (ac etiam Psalmist, dicit, quod Deus posuerit Tabernaculum suum in Sole) sit principalis ventorum motor atque incitator, atq; hinc pergit Sapiens subnectendo istiusmodi sermonem praecedenti; conuersione sua circumiens properet aer, (vel, vt Hieronym. interpretatur, spiritus) & secundum circuitus suos reuertatur aer, quod Pagninus sic interpretatur, subinde circumeundo pergit ventus & ad circuitus suos reuertitur ventus. Hieronymus ait: Lustrans in circuitu suo pergit spiritus & in circulos suos reuertitur: quo quidem sermone sat luculenter arguit Sapiens, quod aeris dispositio ã motu solari dependeat, vtpote cuius radij sunt quasi anima ad eum, Vnde non aliter mouetur aer naturaliter, quam ad motum solis, cuius actione agitatur motu circulari. Hinc igitur est quod venti dicantur infantes Titanis, Astrea, & Aurora, quatenus à calore Solis geniti, vt ait Aristot. qui aerem reddunt subtilem & rarum, hocq; praecipue in Aurora: At vero dicuntur mandatis Iunonis obedire quatenus non flant nisi in aere qui dicitur Iuno. *Pari ratione videmus spiritum vitae ab oriente microcosmi hoc est à cordis Thalamo tanquam Aeoli microcosmici, capsula spirare, atque afflatu omnem sanquinis spiritum aereum secum in gyrum quasi rapere,* mediantibus cuius radiis viuit ille spiritus, & motu viuifico venti tam aquilonares & meridionales, hoc est lienales & hepatici, quam occidentales in microcosmo excitantur; nam vt in superiori Sapientis sermone dictum est; Ortus Sol postquam occiderit iterum ad locum suum aspirat vbi oriatur, properat ad meridiem & circumit aquilonem, conuersione sua properat aer. &c. Sic etiam in microcosmo ad imitationem macrocosmi dicere possumus, Ortus solis viuifici seu caloris vitalis postquam occiderit, in vasa spermatica, & tum postea subtus in vuluam seu terrae meridiem descenderit, *iterum ad nouum quasi ortum aspirat, & properat per ramos aortae, ad meridiem hepaticam,* & *septentrionem lienalem,* & in iis flatus varios excitat: Nam cum cordis flamma sit solis propago, & verus filius (vnde dicitur cor sedes animae humanae, vt Sol est sedes animae mundi & illa anima in corde à Zenone ignis naturalis nuncupatur, & à Prometheo ignis coelestis, vita hominem ditans) sequitur, q ipsa mouceatur ad motum solis, vtpote quae est radius eiusdem, quae ab eo separari nequit, vnde fit vt pars ad totius motũ mouceatur. Atq; hinc erat quod Merc. Trismeg. hominem mundi filium, & per consequens eius cor Solis filium, vt cordis calorẽ lucis internae Solis, seu mundi animę filium dictitauerit. Vnde vt à Solis mundani centro eiacùlantur vitae & lucis viuificae spermata in spiritum mundanum (quae etiam à corde hauriuntur, mediante inspiratione) sic etiam à solis microcosmi centro seu cordis anima calor vitalis undique in spiritu microcosmico (qui etiam ab aere mundano deriuatur) disseminatur atque dispergitur, quod etiam verbis expressis fatetur propheta regius hoc modo: Cor tuum custodi supra omnem obseruationem, quia ab eo prodeunt actiones vitae.

be confirmed if we note two other works of his in which he used the same general arguments to come to the same conclusion. And as these passages were written after Harvey's work was published, and since he refers to Harvey with admiration in one of them, we can assume that this line of argument was for him a convincing one as proof for this concept of the circulation.

The first of these two documents is Fludd's reply to Parson William Foster who had attacked him in a short pamphlet against the weapon salve (1631). As he had accused Fludd of being a magician in this work, the latter hastened to reply within the same year to clear his name of this charge as well as to uphold his opinions on the power of curing by sympathy. The main part of Fludd's answer does not concern us here, but he did take the opportunity to put forth his views once more on the mystical properties of the blood and why there was a circulation of it. And as his treatment of this material is almost exactly the same as that which he had put forth in the *Anatomiae Amphitheatrum* eight years earlier, it lends added weight for our interpretation of the earlier passage. He wrote that

> It is apparent, then, that the incorruptible Spirit is in all things, but most abundantly (next vnto the great world) in the little world called man: For as in the great world, God is said rightly by Ierome his translations (leauing the corruption of others) to haue put, his Tabernacle in the Sunne, from whence by a perpetuall, and neuer dying motion, hee sendeth forth life and multiplication, to euery member and creature of the great world, and by the agility of his Spirit, (for Salomen saith) it is omni re mobilior, the most moueable of all things, hee moueth and giveth life vnto the whole Spirit of the world; which also the same wise man doth justifie in these words: Sol gyrans à meridie flectitur ad Aquilonem: lustrans universa in circuitu pergit spiritus. The Sunne mouing from the South, bendeth toward the North, illuminating the whole world, the spirit or ayre of it doth moue circularly. Whereby hee argueth, that the spirit in the Sunne animateth and giueth motion, life and spirit vnto the ayrall spirit of the whole world (for without his assiduall motion and act, as Aristotle and all other Philosophers confesse, the ayre would soone be corrupt, and be as it were dead, and of no validity) for the reason heereof, the holy Text concludeth, that the Holy spirit of discipline filleth the whole world. So also, and in the very like manner, the same incorruptible spirit filleth the little world (est enim Templum Spiritus Sancti it is the Temple of the Holy Ghost) and hath put his Tabernacle in the heart of man, in which it moueth, as in this proper macrocosmicall Sunne in Systole, and Diastole namely, by contraction and dilation without ceasing, and sendeth his beames of life ouer all the whole frame of man, to illuminate, give life, and circular motion vnto his spirit. . . .[21]

[21] Robert Fludd, *Doctor Fludds answer unto M. Foster or, the squeesing of Parson Fosters sponge, ordained by him for the wiping away of the weapon-salve* (London, 1631), pp. 65ff.

It is true that this quotation was written at least two years after Fludd had espoused Harvey's ideas in the *Pulsus,* but the arguments used here—even the point of quoting the same Old Testament passage (Ecclesiastes, ch. 1: 4 & 5)—are identical with that used in Fludd's *Anatomy* of 1623.

In any discussion of Fludd's mystical approach to the circulation it is also important to make mention of this *Pulsus* which was issued as one of several parts of his *Medicina Catholica* and was printed between 1629 and 1631. The title-page of this work is not dated, but at the completion of it Fludd dated it 19 October 1629,[22] and, hence, one might expect the date of publication to have been 1630 or 1631. In any case, since we know that Gassendi's attack on him was not published until 1630, we can be fairly certain that this work was composed without his knowledge of Gassendi's forthcoming work against him. Here again he refers to the circular motion of the winds which he explains is due to the general principle of rarefaction and condensation—"thus in a circular manner the world is rotated in its arterial vessels in diastole and systole."[23] And thus having established this motion in the macrocosm he applied it to the microcosm.

> This exactly seems to confirm the feeling and opinion of the learned William Harvey, a most skilful doctor of medicine, most clear in the art of anatomy, and yet highly versed in the mysterious profundities of Philosophy, a man who is my highly esteemed compatriot and the most faithful of the college; about which he instructed the world advisedly and prudently in his little book *Exercitatio Anatomica, De cordis sanguinis in animalibus motu,* and he declared remarkably well with reasons produced from the treasure of Philosophy as well as with demonstrations for the eye.[24]

The monthly circular path of the Moon affects the spirit of the blood, and since the spiritual impression of the Zodiac is in the blood, is there any reason why the Moon should not "seize the arterial blood with it in its circular motion?" Similarly we see the affect of the Sun on the microcosm, but most important of all is

22 Robert Fludd, *Pulsus seu nova et arcana pulsuum historia, e sacro fonte radicaliter extracta, nec non medicorum ethnicorum dictis & authoritate comprobata* (Frankfort, 1631?), p. 93.

23 *Ibid.,* p. 11.

24 *Ibid.,* p. 11. Hoc exactè illam viri grauissimi Gulielmi Haruei, Medicinae Doctoris peritissimi, arte anatomica, quam clarissimi, necnon in profundis philosophiae mysteriis versatissimi, compatriota mihi charissimi, & collegae fidelissimi, sententiam atq; opinionem confirmare videtur; qua, idq; consultè & prudenter satis mundum in libello quodam suo, cui titulus est: *Exercitatio anatomica, de cordis sanguinisq; in animalibus motu;* instruit, insigniterq; cum rationibus à Philosophiae arca depromptis, tum multiformi demonstratione oculari declarat motum ipsius sanguinis esse circularem.

that circular motion of the winds which contain that indispensable vital nutriment to which Fludd never ceases to refer.[25]

B. FLUDD, GASSENDI, AND THE INTRAVENTRICULAR PORES

It would seem then that Fludd was referring to a general circulation of at least the "spirit of the blood" in his *Anatomy* of 1623. However, it is also plain that this theory was not developed by him in any detail at that time, or for that matter after Harvey's work came out in 1628. An experimentalist such as Gassendi would have considered Harvey's work more worthy of consideration and it is no wonder that when he had read Fludd's mystical descriptions, he turned rather to Harvey's experimental account when he discussed the relation of the venous to the arterial blood. Although his work against Fludd did not appear until 1630, as we have seen, it had been completed in February 1629, and in a letter to Peiresc (28 August 1629), he gave his friend an idea of his attitude toward the doctrine of the circulation.

> Le livre dont Mr. Valois vous a parlé, Mr. du Puy en a un exemplaire pour vous envoyer. Je l'avois desja veu avant que partir pour l'Allemagne et en avois dit mon sentiment en ma lettre a P. Mersenne qui enfin se verra peut estre bientost inprimée. Son opinion de la continuelle circulation du sang par les arteres et veines est fort vraysemblable et establie mais ce que je trouve à dire en son fait est qu'il s'imagine que le sang ne sauroit passer du ventricule droit du coeur au gauche par le (septum), là où il me souvient que le sieur Payen nous a fait voir autrefois qu'il y a non seulement des pores, mais des canaux tres ouverts . . . qui rendent cette doctrine evident. Vous verrez quelque jour ce que j'en ay dit.[26]

Hence, it was evident that although this work was an attack on Fludd's entire philosophy, the portion of it relating to the circulation of the blood was to be directed not at Fludd, but at Harvey, and would deal especially with the question of whether or not the blood passed from the right to the left ventricle by means of the pores in the septum.

The following year Gassendi's *Epistolica exercitatio in qua principia philosophiae Roberti Fluddi, medici, reteguntur, et ad recentes illius libros adversus R. P. F. Marinum Mersennum . . . respondetur* was published at Paris. The work itself is a general attack on all of Fludd's writings, and Gassendi takes particular exception to the English physician's chemical interpretation of

[25] *Ibid.*, p. 11. . . . & consequenter ipsum sanguinem arterialem secum circulari suo motu rapit?

[26] Nicolas-Claude Fabri de Peiresc, *Lettres de Peiresc publiées par Philippe Tamizey de Larroque . . . Tome quatrième. Lettres de Peiresc à Borrilly, à Bouchard et à Gassendi. Lettres de Gassendi à Peiresc 1626-1637* (Paris, 1893), p. 208.

the creation.[27] Also particularly offensive to the French theologian was Fludd's neglect, or rather, misuse of mathematics in his interpretation of nature. As a personal friend and admirer of Galileo, he believed that natural phenomena should be studied experimentally in terms of weight, time, motion, etc.,—all quantities which could be measured in some manner or other. Gassendi rightly perceived that this type of research was considered "ridiculous" by Fludd, and that he used numbers in his vast theories primarily in the sense of number mysticism, in the Pythagorean tradition of a search for divine harmonies in nature.[28]

However, of prime interest for this study is Gassendi's critique of the positions of Harvey and Fludd on the vascular system. In his summary of Fludd's description of the blood, based on his *Anatomy* of 1623, he proposed to answer the question of where the arterial blood originated. He stated that Fludd believed

> that the subtle blood which is in the arteries is not seized from the veins either in that manner in which it is commonly taught, that is, by an inflow in a branch of the vena cava into the right ventricle of the heart out of which the blood, having crossed over into the left side rushes forth then into the arteries,—or in that manner in which the extremes can be fashioned together, that is, the venous capillaries with the extreme arteries, and then out of the veins the blood is instilled into the arteries. For he teaches that this (the arterial) blood is simply from that duct by the inspiration of the aetherial Spirit . . . and he does not admit anything from the venous blood "for this reason," he says, "if the heavy and elementary blood, destined for procreating the solid members mixes itself with the spirits of life, confusion would follow."[29]

By bringing up this question Gassendi did not have to discuss Fludd's mystical concept of the circulation which he seems not to have recognized and he suggested that "since the common method of explanation did not please Fludd, he should have listened to Harvey, his countryman."[30] Not only was Harvey's experimental

27 Gassendi, *op. cit.*, vol. III, p. 213.

28 *Ibid.*, p. 215.

29 *Ibid.*, p. 218. Pierre Gassendi, *Epistolica exercitatio in qua principia philosophiae Roberti Fluddi, medici, reteguntur, et ad recentes illius libros adversus R.P.F. Marinum Mersennum . . . respondetur* (Paris, 1630), pp. 128-129. . . . sanguinem illum subtilem, qui est in arteriis, non hauriri ex venis, seu eo modo, quo vulgo docetur; scilicet ramo venae cavae influente in dextrum ventriculum cordis, ex quo sanguis trajectus in laevum, in arterias deinde prorumpat; seu eo modo, quo fingi posset coire extremas, seu capillares venas cum extremis arteriis; sicque ex venis sanguinem in arterias instillari. Docet proinde hunc sanguinem esse dumtaxat ex ducto illo per inspirationem aethereo spiritu; . . . Neque vero quidpiam hic admittit ex venoso sanguine; quoniam "hac ratione," inquit, "sanquis grossus, elementaris, & ad membra solida procreanda destinatus se permisceret cum spiritu vitae, atque sequeretur in opere humano confusio."

30 Gassendi, *Examen*, p. 219. Gassendi, *Epistolica*, p. 132. Denique nisi Fluddo communis explicandi ratio placeret, audiendus forte fuerat Harveus ejus conterraneus.

approach more pleasing to him, but also it supported his own views on the relation of the arterial to the venous blood. Harvey's belief in the connection of the veins and the arteries through capillaries demanded a basic identity of matter between the two types of blood. The Galenical system which Gassendi supported here also called for this because of the percolation of the venous blood through the pores of the septum. Gassendi felt then that the real problem was to decide between the Galenical and the Harveian positions on this question and he went on to summarize Harvey's work in addressing Mersenne:

> If you have not seen it [Harvey's book], the argument is that the blood out of the trunk of the vena cava goes into the right ventricle of the heart through a branch, and then being sprinkled in the lungs, it is collected through the arterial vein and is then thrown together through the venous artery into the left ventricle, out of which, after having been sent into the arteries, at length it is returned into the veins through insensible openings of the arteries and junctions with the veins; and in the same way again out of the veins through the lungs and the heart into the arteries in a perpetual circuit.[31]

But, continued Gassendi, "Although I am fully aware of this point of view, and although it does not seem improbable to me because that ingenious man has so skillfully worked it out both with reasoning and experiments," nevertheless,

> This one thing only I do not esteem in the work of the learned Anatomist, that he does not admit that the blood can cross over out of the right ventricle of the heart into the left through the intermediate septum: because that, he says, is solid, hard, dense and most compact and indeed it does not have anything which they call blind, invisible and obscure porosities. For surely there are present not only visible porosities, but even pathways which are definitely open and spread out besides; however, because of certain revolutions they are not opened in a straight path; I shall explain in detail that which I saw myself while I lived at Aix where as often as a dissection was carried out, I was nearly always present in the anatomy theatre. Moreover, I constantly observed the dissectors for many years when they held the heart before them in their hands to try with a blunt iron knife which they call a spatula a penetration of the septum, and they concluded with the physicians that a transmission of the blood out of the right into the left vessel had to be made through an insensible transfusion. . . . (But) there was an industrious surgeon by the name of Payanus who wished to demonstrate the matter to be otherwise with all of

31 Gassendi, *Examen*, p. 219. Gassendi, *Epistolica*, pp. 132 ff. Nisi videris, argumentum est, quod sanguis ex venae cavae trunco per ramum transversum in dextrum usque ventriculum cordis, & inde in pulmones per arteriosam venam respersus colligatur, atque coniiciatur per venosam arteriam in sinistrum ventriculum, ex quo in arterias immissus, per insensibilia tandem arteriarum, venarumque juncta oscula regrediatur in venas; similique rursum modo ex venis per pulmones, & cor in arterias, circuitione perpetuã.

us looking on. And thus taking the spatula, he approached the septum of the heart to try the penetration. He attempted this not straight on as others do, but he first made the approach most lightly with the edge of the iron entered in beneath (a thousand openings of which the septum is textured, lying open); and he explored the approach always further by twisting the iron up and down, and to the side, most patiently. Why should I delay? The penetration at length was made as far as the vessel on the left. However, as we complained that a break had been made (rather than an honest penetration of a pore), he ordered that a sharp knife should cut the septum down to the iron. After having made the section, we discovered that the passage alone—or canal—was covered with a most tenuous and smooth membrane, (although it led through various curves and passages). Therefore there definitely are these passages . . . and since they are really there, they ought not to be useless, and there is a purpose in readiness, the percolation of the blood out of the right vessel into the left; and I might argue that the arterial blood is derived in this manner.[32]

Although he admired Harvey's work, by implying that the blood was transferred from the right ventricle to the left ventricle in this manner, Gassendi avoided the necessity of having a circulation in his system.

He then went on to suggest that it is the more subtle part of the blood which is percolated through the septum by compression, while the denser part which is left with the smoky wastes enters the arterial vein and proceeds to nourish the lung substance. On the left side the ventricle of the heart is connected with the lungs by means of the venous artery. Through this vessel the smoky and misty aerial residues are exhaled, while a purer air flows into the left ventricle during inspiration. Hence, Gassendi rejected the

[32] Gassendi, *Examen*, p. 219. Gassendi, *Epistolica*, pp. 133-136. Hoc unum tantum in sagaci Anatomico non probo, quod non admittat sanguinem ex dextro ventriculo cordis transire posse in sinistrum per saeptum intermedium: "quia illud," inquit, "Crassum, durum, densum, compactissimumque est: & ne quidem habet quas vocant caecas, invisibileis, obscurasque porositates." Sane enim non modo adsunt non invisae porositates, sed meatus etiam valde hiantes, atque patuli; tametsi per quasdam circumvolutiones, non ductu recto ii aperti sunt; enarrabo, quod ipse vidi. Cum Aquis-sextiis degerem, quoties dissectio celebrabatur, intereram frequens theatro anatomica. Constanter autem pluribus annis observaram dissectores, dum cor haberent prae manibus, tentare ferro obtusiusculo, quod spathulam vocant, ipsius saepti penetrationem, concludereque cum Medicis transmissionem sanguinis e dextro sinu in laevum debere per transudationem insensibilem fieri . . . Chirurgus industrius, nomine Payanus, qui rem secus esse spectantibus nobis demonstrare voluit. Is itaque spathulam usurpans mediastinum cordis penetrare aggressus est. Id vero tentavit non rectâ, ut alii, sed extremo primum ferro subingresso (mille siquidem januae, quae saepti est textura, patent) progressum fecit levissime; quippe ferrum sursum, deorsum, & ad latera patientissime contorquendo exploravit semper ulteriorem aditum. Quid moror? facta demum est in laevum usque sinum penetratio. Ceterum autem, quia nos causabamur factam fractionem aliquam, jussit ipse novaculâ ad ferrum usque, saeptum incidi. Sectione factâ nihil prorsus fuisse temeratum deprehendimus; sed meatum solum, seu canalem observavimus (etsi per varios quasi maeandros, & cuniculos circumductum) membranulâ tenuissimâ, politissimâque intectum. Hi igitur meatus sunt . . . ut cum illi reverâ sint, nec frustra esse debeant, & aliunde causa sit in promptu, ipsa sanguinis e dextro sinu in laevum percolatio; sanguinem illum arterialem hac derivari arguerem.

circulation of the blood primarily due to the vivid impression he retained of the demonstration of the existence of the pores of the septum.

Fludd replied to Gassendi's work in short order. We know from Fludd's reply to Foster that he had already written his reply to Gassendi in 1631.[33] However, at this time there was a two-to three-year delay between the time Fludd completed his manuscripts and the time they appeared in print in Germany. His *Clavis Philosophiae et Alchymiae Fluddanae, sive Roberti Fluddi Armigeri, vt Medicinae Doctoris, ad Epistolicam Petri Gassendi Theologi Exercitationem Responsum* was printed finally at Frankfort in 1633.

Gassendi had charged Fludd with being neither a Galenist nor a follower of Harvey in his interpretation of the vascular system, and in refuting him, Fludd felt called on not so much to discuss the problem of the circulation of the blood, but rather to reply to Gassendi's anatomical and physiological arguments. Therefore in his description of the heart, Fludd discussed the flow of the blood in terms of the valves and the direction in which they opened and closed in much the same terms that Harvey had—without, however, making any inferences about circulation.[34] He stood firmly against Gassendi's belief that the arterial blood is formed from the venous blood by a percolation of the latter across the septum (which Fludd called a circulation[35]) for two major reasons: first because this would mean that there would be too small a difference in heat between the venous and arterial blood, and it would also imply that they had an equal composition; and second because, as Gassendi had implied, only the purer part of the blood can be filtered through the septum in this manner, and the grosser part would be left in the right ventricle for the nourishment of the lungs. He concludes that this cannot be true since the lungs, as a lighter substance, must require a lighter kind of nourishment in the form of blood, not a grosser blood which is more fit for the nourishment of flesh.[36]

[33] *Doctor Fludds answer,* passim. In this work Fludd compares Gassendi's scholarly refutation of his works with Foster's "ill mannered" and "impudent" reply, and he mentions in several places his own reply to Gassendi.

[34] Robert Fludd, *Clavis philosophiae et alchymiae Fluddanae, sive Roberti Fluddi Armigeri, vt medicinae doctoris, ad epistolicam Petri Gassendi theologi exercitationem responsum* (Frankfort, 1633), p. 33.

[35] *Ibid.*, p. 33. Verum si talis etiam fieret sanguinis circulatio; nimirum à venoso genere in arteriosum; (ut ipse ait) tunc, ratione huius, per universum corpus sanguis foret aequalis compositionis in substantia, & caloris minime differentis.

[36] *Ibid.*, p. 33. See above quotation.

But, he continues, even beyond these considerations, is not the very instance which Gassendi cites as proof of the pores in the septum highly suspect? Fludd states that Gassendi

> for the purpose of stating his case, relates a certain experiment carried out at Aix where (he says) at an Anatomical dissection they came upon porous pathways in the septum of the heart by means of a spatula or an obtuse iron instrument, and we can certainly understand why he calls these "thousand doors in the septum" occult. In any case, from this he concludes with the doctors and surgeons who were present at this dissection that it is allowable for there to be an insensible transmission of blood from the right to the left vessel. And he uses this against me. . . . But similarly I can recall that a certain surgeon announced in public that he had with a probe or spatula with a certain irregular motion penetrated that amazing complex or intertwining of veins and arteries which descends from the seed producing vessels to the testicles: which indeed, on account of the subtlety of the texture is impossible, without a violation of the hidden passages except in case this might happen in some individual rarely.

Actually, he continues, just by the constant working of the instrument on the fibers, the continual dilation or extension as the operator seeks a passage, these same fibers may appear upon contraction to be more channelled or porous. But Fludd suggests that it is even more likely that the probe may have broken some fibers and formed the opening in this way. In regard to this problem he states that

> this inquiry was carried out many times with great diligence by many of my colleagues and especially by Dr. Harvey, the most expert anatomist, since he himself made the experiment for his own sake while investigating the question of the circulation of the blood in spite of the tedious nature of this investigation: but not in any one out of the many cadavers that he examined did he find such a septum; and neither I nor any others who with most acute and almost lynx-like eyes saw this when we examined the septum of the heart. From which it may be concluded that the dissection as it turned out at Aix may be allowable in one cadaver or another (if it truly was not done without a violation with the spatula), but from this single case it should not be considered to be universal. For thus in one man such a single vein may be come upon, while in another there may be no spleen and with many others there may be strange and unexpected deviations from the ordinary human composition. And might it not be concluded from this that one might depend too much on the defects or augmentations of some of the parts in one man when necessarily all should be considered? Certainly one or even a second example does not prove the argument—neither does one swallow prove the advent of summer. So in regard to the experiment brought forth by Gassendi, partly we have no faith in it, and partly if it is given in way of a concession to him, we say that one particular does not prove a generality. And in regard

to the generality we know and speak as experts that the same assertion of Gassendi is most false; and we do not blush then to assert with confidence that the septum of the heart is not ordained by Nature to that purpose called for by Gassendi. For if this were the case, it would follow that there would be no difference between the Arterial and Venous blood.[37]

In this work Fludd thus decisively rejected the Galenical concept of the percolation of the blood through the septum, but there is nowhere in the *Clavis* a discussion of the circulation. From the *Anatomy* of 1623 and his *Answer* to Foster in 1631 it is evident that he believed in a circulation of the spirit of the blood, but as proposed by him this was much closer to the views of Bruno than those of Harvey. Only in the *Pulsus* (completed in 1629) had Fludd referred approvingly to Harvey's thesis that all of the blood circulates, and even in that work he had used this only as an additional support for his views on the mystical circulation.

Fludd's views in the *Clavis* on this matter may be seen most clearly in his discussion of the difference between the arterial and the venous blood. Both Gassendi and Harvey had insisted on the basic similarity between them,[38] but Fludd in contrast maintained

[37] *Ibid.*, pp. 33ff. Inprimis sciendum quod autor hic noster, ad statuminandum suam caussam, ad relationem experimenti cuiusdam Aquis-Sextiis peracti recurrat, vbi (ait) se Anatomica inquisitione, mediante spathula seu ferro quodam obtuso, porosos in septo cordis meatus inuenisse, quos mille in septo ianuas, licet occultas vocat; vnde concludit cum Medicis & chirurgis, qui dissectioni tali adfuerunt, esse transmissionem sanguinis à dextro sinu in laevum licet insensibilem. Idque aduersusme. . . . Memini ego Chirurgum quendam iactitasse, se probo aut spathula, irregulari quadam dilatione, admirabilem illum plexum retiformem ab implicatione venae & arteriae factum, qui descendit à vasis seminariis praeparantibus ad testiculos, penetrasse: quod quidem propter contexturae subtilitatem impossibile est, sine meatuum occultorum violatione; nisi raro in aliquo particulari hoc contingat . . . Praeterea ista inquisitio a pluribus collegarum meorum, & praecipue à D. Haruco Anatomico expertissimo, saepius instituta est magna cum diligentia, quatenus ipse ad suam in sanguinis circulationis causam, cum fatigatione huius rei experimentum fecit; sed ne in vnico quidem, ex pluribus cadaueribus inuenit ipse tale quidpiam; nec ego, nec alii, qui oculis acutissimis & quasi lynceis cordis septum sumus scrutati. Quare concludendum est, quod, licet in vno cadauere vel alio (si ita esset sine spathula violatione) res talis Aquis- Sextiis comparuerit, hoc tamen particulare non inferat vniversale. Sic enim in vno homine, vnus inuenitur Ren tantum; in alio nullus Lien, atque per multa alia ab ordinaria compositione humana aliena atque incosueta. At anne ob eam caussam concludendum, nimirum ob aliquos partium defectus vel augmenta in vno homine, necessario omnes debere ita se habere? Vnum certè vel alterum exemplum, non probat argumentum, nec hirundo vnica probat aestatis aduentum. Quare experimento a Gassendo prolato, partim haud fidem habebimus, & partim si pro concesso illi detur, dicimus quod vnum particulare non demonstret generale. At in generali agnoscimus, & experti loquimur, istam Gassendi assertionem esse falsissimam: ac proinde asseuerare haud erubescimus, quod septum cordis, non ad illud officium à Gassendo nominatum à Natura ordinetur. Nam si hoc esset pro statuto, sequeretur, quod nulla esset inter sanguinem Arterialem & Venalem differentia.

[38] William Harvey's position in regard to the relation of the venous to the arterial blood is neatly summarized in his *Second disquisition to John Riolan Jun.* (The following references are to Willis' translation in the *Works* [London, 1847].) He objected to those who stated that the venous and arterial bloods are different (p. 113) and flatly

that they were fundamentally different. To justify this view he explained that the air around us contains certain spirits or aetherial substances vital for life. Fludd's emphasis on the importance of air here probably stems from the Paracelsian belief that life itself is a form of combustion.[39] Part of these spirits are abstracted from the grosser portion of the air and formed into blood "verbi gratia" and this in turn acts as nutrition for the body and eventually is transformed into flesh.[40] This is the main function of the venous blood, but it is not enough to suffice for the true cause of life, spirit, and reason. For these more elevated requirements a second aerial spirit

stated that "sense and reason alike assure us that the blood contained in the left ventricle is not of a different nature than in the right." (p. 114) He attributed the red color of the arterial blood to a straining process and suggested that the arterial blood was the "thinner and lighter part" of the blood. (p. 115) He accepted the existence of spirits within the blood although he seemed rather reluctant to do so and he insisted that these spirits are not distinct from the blood itself and that blood must be "held as corrupt when deprived of its spirit." (p. 117) He concluded that "it is therefore the same blood in the arteries that is found in the veins, although it may be admitted to be more spiritous, possessed of higher vital force in the former than in the latter." (p. 118).

Pierre Gassendi in opposing Fludd likewise stated that ". . . experientiâ certissimâ constat & arteriam venosam, & sinistrum ventriculum cordis, & aortam arteriam cum ramis suis omnibus magnâ abundare copiâ sanguinis ejusdem naturae cum illo, qui in vena cava, in dextro cordis ventriculo, in vena arteriosa est. . . ." *Examen*, 218. He also went on to ask "si sanguis arterialis nullam communicationem cum venali habet, neque ex illo creatur, unde est, quod resectâ arteriâ effluit per resectionem sanguis, non modo qui in arteriis, sed qui in venis etiam est totus? An-non hoc arguit sanguinem venalem, qui post arterialem continuo effunditur, successurum quoque fuisse in arterias, absque arteriotomia? an-non hoc innuit esse meatus, per quos venalis sanguis in cor. & ex corde in arterias transmissione quadam effundatur?" *Ibid.*, p. 219. As mentioned above, Gassendi felt that Fludd believed that the arterial blood did not come from the veins either in the Galenical or the Harveian manner, rather it was formed from the inspiration of an aetherial spirit which became reddened in its continual flow from heaven. Further, he felt that Fludd categorically denied any possibility of the intermingling of the venous and the arterial bloods since the grosser venous blood could not be mixed with the congealed spirit of life. If such a calamity should occur utter confusion would result within the body.

39 Pagel, *Paracelsus* (Basle, 1958), p. 118.

40 Fludd, *Clavis*, pp. 32-33. . . . quod nullus sit aer sublunaris, qui aetheris portione, vel parcius, vel copiosius non fruatur: dicimusque audacter ipsum sanguinem purum, nihil esse aliud, quam aereum concretum. . . . Et quia carnes fiunt ex sanguine coagulato, & sanguis ex aere inspissato in quo est vitae virtus; ideo dicit Moses, quod anima humana & vita aliorum animalium sit in sanguine. His ergo debito modo consideratis, cum diligentia observandum est, quod aer, qui est animae curriculum, si specificetur, priusquam concurrat aut adaptetur ad nutrimentum humanum: verbi gratia, si sit vel in tritico, vel faba, vel pomo, vel ovo, vel bove, vel gallina, &c. naturam suam Catholicam penitus amittat. At vero, priusquam in substantiam aliquam specificam, ad ipsius vivificationem & nutritionem penetrasset, erat vitae pabulum in eo contentum, cum suo vehiculo aptum, ad vitae & multiplicationis actum perficiendum, tam in hac, quam in illa specie, . . . His igitur serio ponderatis, pro certo apparebit, quod aer & thesaurus in eo contentus in pane seu carne, ut primum ab homine comedatur, exacta naturae humanae Alchymia examinetur; & totius nutrimenti pars purior, nimirum aerea ista nutrimenti portio, cum suo thesauro, ab impuro & inutili; . . . residuum vero quasi excrementum, expellitur vel per intestina, vel per ureteres foras. . . . Redacto igitur iam nutrimento ex aere specificato in sanguinem humanum grossiorem (quippe ab aere antea specificato) ex eo tum postea caro exsurgit.

is essential.[41] Fludd identified this spirit as the substance responsible for the procreation of saltpetre.[42] Thus the Fluddean system requires two different aerial spirits for the creation of the two types of blood.[43] However, in spite of their different functions, the two bloods are much alike in appearance since they are both formed from similar aerial substances.[44] Fludd also provided for the meeting of the arterial spirits with the subtle bodies emitted from the

[41] *Ibid.*, p. 33. Ex quibus liquet, quod talis succus specificus, non accommodetur nisi ad corporis humani fabricam; ad vitam vero & animalium Spirtum, & praecipue rationalium, minimè conducit. Cum enim specifica hominis natura consistat in eius interno, & non externo; ideo alius aer, alius aether, & alius vitae Spiritualis fomes, catholicus nimirum, requiritur. Et quoniam nutrimentum istud Spirituale Catholicum, non aliter superfluitatibus scatet, quam illud corporeum seu specificatum; ideo fuliginosior eius pars; retento prius thesauro coelesti, cum puriori sui vehiculi aerei portione, quae est ei loco vehiculi, expellitur. Nam ut non est transitus à coelo ad terram sine medio: ita quidem necesse est, ut praestantior illius medii portio, quasi vitalis scintillae vehiculum, coaguletur in sinistro cordis ventriculo & arteria magna, speciemque induat sanguinis, in quo, iuxta textus Sacri sensum, inest vita seu anima.

[42] *Ibid.*, p. 33. At vero omnes Philosophi in istam coincidunt sententiam: nimirum quod sal nitri ex pura aeris substantia procreetur.

Considerable emphasis has been placed on John Mayow (*Tractatus quinque*—1674) by historians of science because of the similarity of his "nitro-aerial" particles with oxygen. The most recent appraisal of his work and these particles may be found in J. R. Partington's "The life and work of John Mayow (1641-1679)," *Isis*, 1956. Here Partington has shown that the concept of the nitro-aerial particles was in use among several investigators prior to Mayow (i.e., Ralph Bathurst (1654), Malachi Thruston (1664)—see *ibid.*, p. 217). Walter Pagel has pointed out that the concept of a vital nitrous part of the air is Paracelsian in origin (Pagel, *Paracelsus*, p. 118 footnote no. 324). That this was a living tradition among Paracelsians may be evidenced by Joseph DuChesne's identification of the spirit of niter with air (see Ferd. Hoefer, *Histoire de la chimie* (2 vols., Paris, 1842, 1843), II, 28. Joseph Quercetanus, *Liber De Priscorum Philosophorum verae medicinae materia* (S. Gervasii, 1603), pp. 16-24). Fludd's above reference (1633) also belongs to this tradition and it is noteworthy that he states that "all philosophers" agree in this belief. Among these Paracelsians this concept was purely speculative and the experimental approach to this concept by Mayow and other late seventeenth century investigators makes their work appreciably different from the mystical beliefs of their predecessors. Mention should be made here also of two excellent papers by Henry Guerlac in which he has traced this tradition back to the early years of the 17th century in the tract *De sulphure* by Sendivogius; Henry Guerlac, "John Mayow and the aerial nitre. Studies in the chemistry of John Mayow I," *Actes du Septième Congrès International d'Histoire des Sciences* (Jerusalem, 1953), 332-349; Henry Guerlac, "The poets' nitre. Studies in the chemistry of John Mayow II," *Isis*, 1954, *45*, 243-255.

[43] Fludd, *Clavis*, p. 33. . . . si sanguis ille arterialis est subtilior & calidor quam sanguis venalis, certum est, eum ortum suum habere aliunde quam à fonte venoso. Si enim procederet talis à fonte hepatico quasi elementali; tunc non video ego, qua ratione in sua natura calidior redderetur, quam sanguis ille in vena cava. At si dicet, hanc caloris additionem ipsum accepisse à corde, quasi fonte aethereo, dico hoc impossibile esse, inprimis quia cordis natura per se, non est calidior hepate. Hoc enim si esset, semper febricitaret homo. Secundo, si sanguinis additionem caloris à corde reciperet, tunc illa additio non foret naturalis; sed acquisita. Verum si talis etiam fieret sanguinis circulatio, nimirum à venoso genere in arteriosum; (ut ipse ait) tunc, ratione huius, per universum corpus sanguis foret aequalis compositionis in substantia & caloris minime differentis—Of course in this Fluddean system besides the two vital ethereal spirits there is also present in the air the gross substance from which they are extracted.

[44] *Ibid.*, p. 33. Nec mirum est, si eadem sanguinis species adsit arteriis, quae & venis, cum ambo sint, quo ad eorum externum de eodem subiecto, videlicet aere. At differt proprietate specifica aer unus ab alio, non aliter quam una vitae essentia ab alia, quatenus invenis est aliena, & à subiecto specificato desumta; verum in arterias, in sua nuda Catholica & virginea natura, descendit immediate à fonte Catholico. Nonne pariter aquas à nubibus more Catholico coagulatas seu congregatas, & alias ab ipsis proprietate differentes utpote à terra variorum mineralium specie infectas, scaturire cernimus?

veins without suggesting an actual transfer of blood from one system to the other.[45] However, although he did not specifically rule out the Harveian circulation, his primary task in this part of the *Clavis* was to refute the views of Gassendi and he was able to do this without discussing the problem of the circulation in detail.

Actually there is no indication in this work that Fludd would have accepted the Harveian concept of the circulation. Rather, he outlines a vascular system which is basically as incorrect as Gassendi's.[46] Although his attitude toward the nitrous spirit of air and his rejection of the intraventricular pores may be commended, nowhere does he state that the venous blood mixes with the arterial blood. At all times he discusses the two systems separately and he errs badly not only in his insistence that the venous blood is formed from an aerial spirit, but also by stating that a second source of arterial blood may be found in the "transmutation" of bile into this "animal gold."[47] It seems evident then that Fludd's concept of the circulation was considerably different from Harvey's.

These major problems with which Fludd and Gassendi were concerned—the part played by the atmosphere in respiration, the role of the septum in the motion of the blood, the relation of the venous to the arterial blood, and the meaning of the circulation—were important ones in the years after Harvey published his work in 1628. And yet, as with most verbal duels, neither party convinced the other. Fludd died only a few years later, in 1637, while Mersenne who had instituted the whole affair seems to have accepted the idea of the general circulation of the blood as early as 1634 in his *Questions theologiques*.[48] Gassendi, on the other hand, was so certain that there were open passages in the septum of the heart that he refused to accept the circulation of the blood for many years. His account of the demonstration of the pores in the septum which he had witnessed so many years before was repub-

[45] *Ibid.*, p. 37. . . . sed affirmaui, quod coeleste arcanum vitae delitesceret in sanguine tali, quodque specificam nutriti indueret naturam, actum postea, per admirabilem illum plexum ex arteria influens, cum suo vehiculo spirituali seu flore tenuissimo arteriali, miscet se cum subtili corporali ex vase venali emisso :ad quod non aliter se habet, quam anima ad corpus, seu coelum ad terram. . . .

[46] *Ibid.*, p. 80. Fludd's fullest account of the blood in the *Clavis* other than the references already noted may be found on page 80 of that work where he discusses the preparation of the arterial blood from the mystical inhaled "panem de coelo" as well as the venous blood. The latter he discusses in alchemical terms much as he had in the *Anatomiae amphitheatrum*.

[47] *Ibid.*, p. 80. . . . quod biliosum est, per descensum instillat in cistam fellis; aqueam vero & serosam substantiam, effundit in vesicam, mirabili Alchymiae naturalis artificio; ac denique quod est de veritate, transmutat in rubicundum sanguinem, quasi aurum animale.

[48] Lenoble, *op. cit.*, p. 501n.

lished often in the next thirty years,[49] and it was only in his massive *Syntagmatis Philosophici* which was published posthumously in 1659 that he gave an account of the heart which finally relinquished his insistence on the role the septum had to play.[50]

The first half of the 17th century was not a period in which we can simply classify all of the natural philosophers as either upholders of tradition or experimentalists, as ancients or moderns. For truly both Fludd and Gassendi were experimentalists. The latter based his major argument aganist Fludd on what appeared to him to be the perfectly acceptable experimental evidence he had witnessed himself of the penetration of a septum even though he admitted that he had seen many other attempts to do this which were unsuccessful. It took the mystic Fludd to point out to him that a whole anatomical system cannot be based on the results of one dissection. Fludd also sought experimental evidence for his statements and he was willing and able to oppose Gassendi's views with his own observations when it was necessary. However, to Fludd the speculative proofs based on the Mosaic philosophy carried far greater weight than experimental evidence.

If we cannot say that one of them was an experimentalist and the other was not, neither can we say that one was more of an upholder of the ancients than the other. While both of them attacked Aristotle, nevertheless both of them were strongly influenced by their heritage. Gassendi's insistence on the pores in the septum clearly mark him as the champion of traditional thought in this case although when he favored the identity of the venous and the

49 Séverin Bineau, *De integritatis et corruptionis virginum notis*—to which is appended Gassendi's *De septo cordis pervio observatio* (Lugduni Batavorum, 1639). Other editions appeared at the same place in 1641 (this is the edition which I have used and which contains the Gassendi extract on pp. 261-263) and 1650, while a fourth edition was printed at Amsterdam in 1663.

This short extract from Gassendi's *Epistolica* has often been considered as an independent work. Actually it is only the description of the demonstration made by the surgeon Payanus (see footnote 32). The *De septo cordis pervio observatio* begins "enarrabo, quod ipse vidi" without including the previous two sentences which specifically state that the intraventricular pores are being referred to. H. P. Bayon, who worked only from the *De septo pervio* on this point, thus assumed that Gassendi was merely describing the opening between the auricles, the foramen ovale, which exists in the foetus but is closed at birth. Occasionally this remains open in an adult and a heart from such an individual was described by Caecilius Folius in 1639 (see G. K. Tallmadge, "Caecilius Folius on the circulation," *Bull. Hist. Med.* (1954, *28*, 15-31). Bayon thus stated that Gassendi had seen and described a second case of the foramen ovale ("William Harvey, physician and biologist: His precursors, opponents and successors," *Ann. Sci.* (1938, *3*, 87). On the other hand, B. J. Gottlieb, who was aware of the fact that this extract originally was taken from Gassendi's refutation of Fludd, did not make the same error (Bernward Joseph Gottlieb, "Elegans de septo pervio observatio," *Sudhoffs Archiv.*, 1957, *41*, 345-348.

50 Gassendi, *Opera omnia*, vol. II, pp. 271ff. See also the discussion of Gassendi's conversion to the circulation in Bayon, *op. cit.*, p. 88.

arterial blood, he was a Harveian as well as a Galenist. Similarly, Fludd's indebtedness to Aristotelian as well as neo-Platonic and Pythagorean thought is evident throughout.

Fludd had merely restated the then current concepts of the chemical and the cosmic circulations, but his speculations were not based on experimental observations and they only related to the "spirit" of the blood. Only after the publication of the *De Motu Cordis* did Fludd specifically refer to Harvey's work as further proof of his own metaphysical conclusions. The chemical, the mystical, and the experimental concepts of the circulation are reflected in the work of both authors, but Fludd stressed the mystical explanation which was soon to be ignored while Harvey's experimental approach heralded a new age in the history of the biological sciences.

Ibn Māsawaih and His Treatise on Simple Aromatic Substances:

Studies in the History of Arabic Pharmacology I

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THE Arabs and Persians far surpassed the Greeks and Latins in pharmacology and pharmacognosy. Not only did they systematize the pharmacological knowledge of the Greeks, Indians, and Babylonians, but the writers in Arabic made many genuinely original contributions to enhance the materia medica of ancient times.[1]

Before the Arabs, the most important Greek contribution to this field had been the work of Pedanios Dioscorides who lived in the first century A.D. He was a native of Anazarba, Asia Minor. With the Roman army, he traveled throughout the Mediterranean area. In this period he studied the works of his predecessors, the herbalists, Krateuas, Mithridates (both, end of the 2d cent. and beginning of the 1st), Nikander (*c.* 200 B.C.), Pamphilos (1st cent. A.D.), and others.[2] In addition, he made many medical and pharmacological observations in the countries in which he worked. It is possible that Ḥunain ibn Isḥāq made a Syriac translation of Dioscorides' Materia Medica in the 9th century. It was certainly made available to Arabic scholars *c.* 854 at Baghdad when a translation was made directly into the Arabic from the Greek by Iṣṭifan ibn Basīl (Stephanos). The latter was a pupil of ibn Isḥāq. Other translations of this work were made later.[3] The only other Greek herbal to have an important rank in classical antiquity was the *De simplicibus* of Galen (*c.* 180 A.D.).

Greek writers on pharmacology were not too well acquainted with much of the medicine of the East nor with their pharmacopoeia. It was the Arabs who brought this knowledge to the West from Mesopotamia, Persia, Aizerbaijan, India, Ceylon, Tibet, and China. One of the earliest in the Arabic world to write on pharmacology was Abū Zakarīyā' Yūḥanā ibn Māsawaih (b. 777,

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1 *Cf.* Holmyard, E. J. Medieval Arabic pharmocology. *Proc. roy. Soc., Sect. Hist. Med.* 1935, *29*, 99-108.

2 Singer, C. The herbal in antiquity. *J. Hellenic Studies*, 1927, *47*, 1-52.

3 Meyerhof, M. Esquisse d'histoire de la pharmacologie et botanique chez les Musulmans d'Espagne. *Al-Andalusia*, 1935, *3*, 1-46.

d. 857 in Samarra). He was also called Māsūya, or Mesue Maior.[4] Māsawaih was the last great physician of the ancient medical school at Jundīshāpūr. Born the son of an apothecary, he studied medicine with Jibrīl b. Buḫtyeshū' of Hārūn. During the reign of Caliph al-Mā'mūm (813-833), he was called to Jundīshāpūr. For about fifty years, he was personal physician to a succession of caliphs. At one point, he was also head of the Academy library. Māsawaih's most famous pupil was the physician Ḥunain ibn Isḥāq. Ibn Isḥāq was the most fecund of all the translators from scientific Greek into Syriac and Arabic.

Very little is known of Māsawaih personally except for some brief tales. One account relates that his priest once came to him and complained of a stomach ailment. Māsawaih prescribed a number of medicines for him. The priest protested that he had already taken many drugs without relief. Māsawaih, who was a Christian, retorted, "Become a Muslim then, and you will be cured." It is also related that the caliph whom he served was in a bad humor one day because the fish were not biting. Annoyed at his failure, the caliph asked Māsawaih to remove himself from his right side since he was evidently a man who betokened ill. Māsawaih responded that this was untrue since he had been the son of a Sicilian slave who had been sold for 800 drachmas and was now the confidante and counselor of a caliph and a very happy one at that. This was certainly, he said, not a man who bade ill. Māsawaih then went on to explain that the man who causes bad luck is one who allows himself to be swept away by dangers to which he had exposed himself. This was the man of evil augury. The caliph understood.[5]

According to ibn abī Uṣaibi'a, Māsawaih wrote 44 works. Most of these, according to the titles, were on medical subjects. Not all are now extant.[6] The work examined in this article is called in Arabic, *Kitāb jawāhir al-ṭīb al-mufrada (Muḫtaṣar fī ma'rifat ajnās al-ṭīb ilḥ)*, Simple Aromatic Substances. There are two known copies. One was formerly in the library of the late P. Sbath of Cairo,[7] and another in Leipzig, Arab. Cod. 768. Owing

[4] During the renaissance, he was called Johannes Damoscenus. *Cf.* Leclerc, pp. 103-104; Mieli, pp. 71-72.

[5] For biographical references: Ibn abī Uṣaibi'a (1203/4-1270). *Kitāb 'uyūn al-anbā' fī ṭabaqāt al-aṭibbā'*. Cairo, 1882. 2 vols. (vol. 1, pp. 175-183); Bar Hebraeus 1225/6-1286). *Muḫtaṣar ta'riḫ al-duwal*. Ed. by Anṭūn Ṣāliḥānī. Beyrut, 1890, pp. 227-228; Jamāl al-Dīn al-Qifṭī (1172-1248). *Ta'rīḫ al-ḥukamā'*. Abridged *c.* 1250 by M. b. Alī al-Zawzanī. Berlin, 1903, pp. 380-391; Al-Nadīm (995). *Fihrist al-'ulūm*. Ed. by G. Flügel. Leipzig, 1871/1872; Leclerc, vol. I, pp. 103-104; Wüstenfeld, pp. 23-24.

[6] Ibn abī Uṣaibi'a, p. 183; *cf.* GAL, vol. I, p. 232; Suppl., vol. I, p. 416.

[7] Ed. by P. Sbath in *Bull. Inst. Égypte*, ser. VI, 1937, *19*, 5-27.

to delay in procurement, the latter has not been seen by the author. Translation and comments here given are based on Sbath's text plus some corrections. Sbath discovered his manuscript in Aleppo in 1933. It is dated 971 A.H. (1563 A.D.); it was copied by the Archdeacon Yūḥanā ibn 'Abd al-Masīḥ al-Anṭākī. It is not at all surprising that Māsawaih devoted a treatise to the subject of odoriferous materials used in pharmacology. From very early Sumerian times, physicians had distilled and made use of aromatic materials.[8] Thyme, myrtle, and various odoriferous resins are among those mentioned in the oldest known Sumerian medical tablet of the 3d millennium. The importance of these aromatic simples as the foundation elements in the most ancient pharmacopoeias seems not to have diminished with the Muslims (8-12 cent.). The work of Māsawaih, in this case, is interesting in that it gives what were considered the most important aromatics of the time. The author also describes the pharmacological properties of most of them and their favorable and unfavorable qualities. Particularly of note for the history of pharmacology in the 9th century are the distant regions from which the aromatics were brought — India, Tibet, Jiddah, Yemen, Syria, Aizerbaijan, Andalusia, Persia, Iraq, China, and the East of Middle Africa.[9] Most of the Greek materia medica, on the other hand, had come from the Mediterranean area.

The aromatics in this small treatise are to be found in the Greek, Indian, and Babylonian pharmacopoeias with the possible exception of a very few whose identifications are still uncertain. It was not unusual in medieval Arabic times to write up the preparations or lists of aromatic substances in treatise form since this had been done not only in Dioscorides but also in India[9a] and in Babylonia.[9b]

Some of the later Arabic texts on the subject seem to have copied part of their material word for word, either from Māsawaih or from a common source. These include such well-known authors on pharmacology and botany as abū al-Qāsim (d. *c.* 1013), al-Tamīmī (end of 10th cent.), Aḥmad ibn abī Ya'qūb (d. 995), and others. Since al-Mas'ūdī died in 957, there is a possibility that

[8] Levey, M. *Chemistry and chemical technology in ancient Mesopotamia.* Amsterdam, 1959, chaps. 4, 11.

[9] For a wealth of information, see Schmidt, A. *Drogen und Drogenhandel im Altertum.* Leipzig, 1924.

[9a] *Cf.* Ray, P. *History of chemistry in ancient and medieval India.* Calcutta, 1956, pp. 236-238.

[9b] Ebeling, E. Parfümtexte und kultische. Texte aus Assur. *Orientalia,* 1948-1950, *17,* 129-143, 299-313; *18,* 404-418; *19,* 265-278.

Māsawaih knew his *Murūj al-ḏahab wa-ma'ādin al-jawāhir*. This transmission of knowledge within the Arabic writings will be checked with the publication of further texts in Arabic pharmacology presently contemplated by the author.[9c]

It may be noted that the actual winning and final preparation of the aromatics is not discussed here. They were evidently brought in a dried or concentrated state ready to be worked on by the physician-pharmacist.

The identification of some of the substances is not yet final. Certainly, where a species has been ascribed to a plant there may be still greater doubt. Identification is made more difficult where the pharmacological action of the materia medica is not given, or which may have been listed primarily because of their use as emollients, diluents, or flavoring agents. Further, the Indian pharmacological uses do not always coincide with those of the Muslims. Fuller study of unpublished Arabic source texts and their translations such as the present one will lead not only to more definite identification but also to a more complete understanding of the history of Arabic pharmacology and medicine. With the very small number of definitive Arabic pharmacological works studied and published until the present, it is too early to draw any wide conclusions.

Transliteration of Arabic names follows their most common rendering into the Latin alphabet. Annotation of the more important references has been made for the basic aromatic materia medica mentioned mainly for use in further studies in Arabic pharmacology to follow. The abbreviations used are noted at the end of the article. There is also a list of substances mentioned, translated from the Arabic.

The translated text follows.

Simple Aromatic Substances

In the name of the father, son, and holy spirit, the one God, amen. We begin to write the book of Yūḥanā b. Māsawaith on simple aromatic substances, their names, properties, and provenance.

The Principal Ones[10]

Five: musk, ambergris, aloe, camphor, saffron.

9c *Cf.* 'Isā.

10 This early Arabic division of aromatics into principal and secondary is about a century before al- Mas'ūdī (d. 957), *Murūj al-ḏahab* . . ., ed. by C. B. de Meynard and P. de Courteille. Paris, 1861-1877, 9 vols. (vol. I, p. 367). He gave the same principal aromatics. Secondary (*afāwīh*) ones given are nard, clove, sandal, nutmeg, rose, cassia, *zarnab*, *qarnuwa* (cf. I.B.S., vol. II, p. 295), cardamom, cubeb, seed of carpobalsam, zanthoxylin, mahleb, *wars*, costus, *azfār*, *burank*, lentisk, *lādan*, storax, *kamala*, *ḏarīra*, zibeth.

THE SECONDARY ONES

Nard,[11] clove,[12] sandal,[13] nutmeg,[14] fennel,[15] rose,[16] *falanjah*,[17] *zarnab*,[18] cinnamon,[19] Indian pepper,[20] cardamom,[21] cubeb,[22] small cardamom,[23] seed of *mīsum*,[24] Indian lotus,[25] *mahaleb*,[26] *wars*,[27] costus,[28] Ungues odorati,[29] *bunk*,[30] lentisk,[31] laudanum,[32] storax,[33] *kamala*.[34]

PRINCIPAL ONES

Musk[35]

There are many kinds which differ in their relative superiority.

[11] *Sunbul*. A general name for various nards.

[12] *Qaranful*.

[13] *Ṣandal*. Probably Santalum Album L.

[14] *Jawz* bawwā. From Persian *Jawz* = nut, *buwā* = aromatic. Possibly Myristica fragrans Houtt. It is an Indian spice used in India today. *Cf.* Maim., No. 71.

[15] *Basbās*. An umbellifer still called by this name in the Maghrib. Its fruit is a potent carminative.

[16] *Ward*. Still used widely in the Far and Near East in pharmacology.

[17] There is doubt that it is a fern after the Spanish = *falağa* = *helecho*. *Cf.* Maim., No. 137; Dozy (under *falanjah*); Qurra, par. 146—a kind of cubeb. It may also be a bindwood or cassia.

[18] This may be similar to the *falanjah*. It has a yellow aromatic flower—Maim., No. 137. Steingass (under *aflanja*) says it is the name of a seed resembling mustard seed with an aromatic odor. Under *falanja*, it is a red seed used as a perfume. It may be Flacourtia cataphracta according to Leclerc or Taxus baccata according to Guigues.

[19] *Qirfah*. Cinnamomum ceylanicum Breyn. Inferior to the Chinese type, *dar ṣīnī*. *Cf.* Ghāf, pp. 471-475 where Meyerhof claims that *dar ṣīnī* was unknown in early middle ages. Present text shows it was known in 9th century.

[20] *Harnawah*. Fruit of the Aloexylon Agallochum Lonr.

[21] *Qāqullah*.

[22] *Kabbabah*. Petiolate fruit of the Piper Cubeba L. Used in India as a disinfectant for the urinary tract.

[23] *Hāl bawwāh*. Elettaria Cardamomum White and Matern. A cardiac drug.

[24] *Mīsum* or *mīsam*. Possibly bark of the Acacia nilotica.

[25] *Faghirah*. Perhaps agnus-castus.

[26] *Maḥlab*. Prunus Mahaleb L. or Cerasus Mahaleb Mill.

[27] *Wars*. Perhaps Flemmingia rhodocarpa Bak. or Memecyclon tinctorium. I.B.L., vol. III, p. 409; Maim., No. 123; Qurra, par. 276.

[28] *Qusṭ*. Auklandia Costus Falc. *Kuštam* in Sanskrit. Expectorant and antiasthmatic. Maim., No. 338.

[29] *Azfār*. For Unguis odoratus, *cf.* Garbers, pp. 178-179; perhaps Strombus lentiginosus, *cf.* Wiedemann, *56*, 329.

[30] *Bunk*. No identification.

[31] *Ḍarw*. Pistachia Lentiscus L. Awwām, vol. II, pp. 368-370.

[32] *Lādhan*. Resin of Cistus creticus L. Astringent used in collyriums, antidysenterics. Akkadian = *ladanu*. Garbers, pp. 250ff.

[33] *Maiʿah*. Probably Styrax officinale L. *Cf.* O. Steuer. *Myrrhe und Stakte*. Wien, 1933.

[34] *Kamala*. Rottlera tinctoria Roxb. Purgative and anthelmintic.

[35] *Misk*. *Cf.* Garbers, pp. 271-274 for various types of musk. Also in Talmud Babli, Barochat 45, Yerushalmi, Barochat, Per. 6. Although Māsawaih's text is very brief, nevertheless the resemblance to other Arabic texts is easily seen in al-Nuwairī's (d. 1332) quotations of some Arabic pharmacologists and botanists. *Cf.* his *Nihāyat al-arab fī funūn al-ādab* in Wiedemann, *49*, 26-30; Qurra, par. 53, 185, 300. *Misk* comes from a similar word in Persian. It is a secretion found in a vesicule at the prepuce of the male Moschus moschiferous common in lower Tibet. Masʿūdī, in his *Murūj al-dhahab*, vol. I, p. 353, states that the Tibetan variety is better than the Chinese because the Chinese must go through a harmful sea journey. This is the exact statement of Māsawaih. *Cf.* Ainslie, pp. 228-229 who states that, in India, it has long been used as a stimulant and antispasmodic. It is also used in dyspepsia, typhus, and, when combined with opium, in dysenteric complaints. European practitioners, in the 18th century prescribed musk for gout, tetanus, cholera, typhus, and other diseases. For polypharmaceutical preparations including musk, *vide* Garbers, pp. 31-38.

The best is the Sogd type; it is found between Tibet and Sogd.[36]

It is then carried to distant regions on one's back. Then there is the Indian type; it is found between Tibet and India and Daibul.[37] It is then transported by sea. Also, there is the Chinese; it is inferior to the latter in the length of time it can hold up at sea. Perhaps they are dissimilar because of differences in the grazing places. The best is in a grass pasture containing hellebore.[38] It is found in Tibet or Kashmir, or in one of them. The next best is a pasture in which one finds nard, used by the perfumers; it is in Tibet. The most inferior is that pasture whose grass is called 'the bitter.' The smell of that grass and its root is the odor of musk except that musk odor is stronger and sharper.

The falsification of musk is frequent. He who practises the art of falsification knows the mystery. Those who sell it know the appearance of it; it is like the dung of the gazelles, resembling the vesicle of musk, and like the tin, iron, and silver.[39] It is falsified with everything that makes it heavy and with whatever is put in it and is inside it.

The best of musk in odor and appearance is apple-like. Its odor resembles that of the good Damascan apple and the Lebanese apple. Its color is more yellow and it is in between the large and the small. Then, that following it is more black than it is. It approaches it in odor but is not exactly like it. Then, that which is blacker yet is more inferior. We heard that some of the people of India say that musk is in three colors. The best is the original, known musk, and two other musks. One of them is made from dry mixtures found there from plants which have no musk in them at all. They recommend its use and purchase in the regions of its origin and the lands bordering them. Another is a musk that they use but do not recommend. This is so since it does not keep but it changes and deteriorates. There is a baseness in it or its worth has vanished. Some people of the import trade and perfumers already know the third one by its odor. The majority do not know it, and its mistaking is great. The musk brought from the interior of Kashmir and its vicinity is not good. It is not even near the one which is not recommended. This is also used and not used. It is half of the price of the good, or approximately so.

Musk is warm, gentle, penetrating, and good for the heart. It stops bleeding if it is put on a wound. One may substitute it in place of the castoreum[40] which is the closest thing to it.

[36] A region in ancient Turkistan.
[37] A commercial center in Sind, in northwest India.
[38] Helleborus orientalis.
[39] Probably meaning their weight. Text uncertain.
[40] A substance with a strong odor consisting of the dried secretion of the perineal glands obtained mostly from the beaver. Maim., No. 79; Diosc. W., vol. II, p. 24. *Jundabādustur* is from the Persian *gundbīdastar*, meaning castoreum.

Ambergris[41]

There are various kinds of which some are superior. However, they are known before experience by their provenance. The best of the types of ambergris is the *salāhaṭi*. It is superior. The best of the *salāhaṭi* kind is the blue type, very oily, fatty, used in perfumery. Then, there is the *qāqulī*[42] which has a good odor and is a little dry. It is inferior to the first and is not good for perfumery except in case of necessity. It is for refreshing the air. Then there is the *mand;*[43] it is the most inferior and is found in many varieties. Of the *mand,* that from Shaḥr[44] is its best. One knows it by its color which is black with yellow in it. It dyes the hand if it is touched by it. Its odor is like that of dry ambergris; it does not, however, remain in water. It is best as an unguent. It does not yield the result obtained from the dry. It is used in perfumery when the *salāhaṭi* is hard to find. Of the *mand,* that from from Zanj[45] is like the Shaḥr type. It is inferior to it in odor, black with no yellow in it. Of the *mand,* there is the purple-red. It dyes the hand. It is not used with aromatic salve except rarely. This is good to make the dye disappear from the hand. Then, there is the *samakī* type; it is ambergris which the fish and the birds eat at sea. Then it kills that which eats it and the waves cast it ashore. It becomes spoiled and the ambergris remains a liquid similar to pitch. It is bad in aromatics and in odor. With it one falsifies the best [ambergris].

The *salahaṭī* and *qāqulī* types[46] both come from the region of Sofala, India. The *mand,* Shaḥr type, comes from the Yemen coast, bounded by Oman to the coast of Haḍramūt. Then it stops a distance of some days' journey this side of Aden. The Zanj. [black] and red-purple types both come from the land of Zanj. One says this also of the Shaḥr variety; however, the Zanj is named for its black color.

It is said that ambergris is a plant on the floor of the sea. Also it is said that it is dung of an animal that is in the sea. Further it is said that it is the excrescence of the sea.

Ambergris remedies the humours of the aged; it is put into electuaries prescribed for them.

41 *'Anbar.* Garbers, pp. 168-173, 255-258, 38-39; Wiedemann, *49,* 30-32; *56,* 330-332; Mas'ūdī, vol. I, pp. 333ff. says that ambergris is found on the shores of Shiḥr which is in Arabia, and on the Syrian and Spanish coasts. From the latter it is brought to Egypt. It is a biliary concretion in the alimentary canal of the sperm whale. It is used as an aphrodisiac in Bengal. To the Arabs, its pharmacological value lay mainly in its odoriferous property when added to other drugs. *Cf.* Wiedemann for opinions of Aḥmed ibn abī Ya'qūb and al-Tamīmī on ambergris. Liquid storax was often used as a falsifier for ambergris.

42 From Qāqula, west coast of Sumatra.

43 Persian. A species of jet or black ambergris.

44 Arabian coast from Oman to Aden.

45 Indefinite territory including Abyssinia and the adjoining African interior. After Lane.

46 Garbers, p. 172; Wiedemann, *49,* 31.

Aloe[47]

There are various types. Of it, there are the Indian, also called the *mandalī*,[48] and the *samandrūn* that comes from the district of Samandrūn,[49] the region of Sofala,[50] India. There are superior kinds; the best are the black and the blue with much juice which is heavy, solid, viscous. There is no white color in it and it is not eaten away. The remainder after being burned on the fire is an abundance of rind. Some prefer the blue; others prefer the black. In a large lump, there is the weight of a manna. The *qumarī* type is inferior to the Indian. The best of the *qumarī* is the dull black type, pure from the white. The remainder is burned in the fire to get rid of it. It comes from the region of Qumār.[51] It is a country of the Sofala lands. The lump comes in a half ratl. The *ṣanfī* type, in certain cases, is equal to that from Qumār, and is perhaps superior to it. It comes close to it in price, in attributes, and in description. It comes from the region of Ṣanf,[52] in the land of Sofala, a few days' travel from China. The best of the *ṣanfī* type is that which is viscous with an abundance of juice. It comes in a lump of two ratls. Then, there is the *qaṣfī* whose origin is Chinese; it is aromatic and moist and inferior to the *ṣanfī*. It is brought from China. A lump is half a ratl. The Chinese type, which is called the *qashūr*, is aromatic and moist. It is more sweet and gentle in odor than the *qaṣfī*. It is lower than it in price. The other Chinese type is found in bone like the wood of the heavy *zanjī*. Of it, there are types other than these, all inferior to it. These are the *mantā'ī*, the *jalā'ī*, and the *lūkīnī*. They are different in price and preparation. It is not the kind that kings use. All come as a lump of three mannas.

It is said that the aloe is a tree that you cut and bury in the ground about a year. The earth eats part of it—whatever is not the aloe—and whatever is left is the aloe. It is said that in the valleys, where some parts of the trees which had been broken in the mountains fall, it rots in the earth and the rainwaters get to it. It is said that aloe is from the trunk of the tree, and it is said that it is also from its thick branches.

Aloe is good for the stomach; it makes it strong. It is good for the nerves, for some liver ailments, for fainting, and for disorder of the stomach.

47 *'Ud.* Diosc. W., vol. I, p. 22; Garbers, No. 122. In India, it was a valuable remedy in ophthalmia. The pulp of the leaves is washed with cold water. This pulp with a little burnt alum is put in a piece of fine muslin cloth and applied to the eyes (Ainslie, vol. II, pp. 169-170). Aloes-wood is still used in the Near East for fumigation. Maim., p. 145. Various authors as al-Nuwairī, Ḥusain ibn Yazīd al-Sīrāfī, and others lay great stress on the provenance of the aloe since this is a sign of its value, Wiedemann, *49*, 33-38. In Babylonia, it was used for strangury and as a stomachic. DAB, pp. 129-130. In Akkadian it is called *šam ṣiburu*. Its cognate in Arabic is *ṣabr*, and in Syriac *ṣabhrā*.

48 From Mandal-possibly Mandarī, a port of India from which travellers sailed to Ceylon. *Cf.* Ferrand, G. *Relations de voyages* . . . Paris, 1913/1914, vol. I, p. 315.

49 Samandūr. An ancient Indian port near Bombay.

50 The lower region. In Arabic, *sufālah*.

51 Khmer. Approximately ancient Cambodia.

52 City of Chanf in eastern Indochina. In medieval times, Ṣanf was well known as the point of origin of much of the aloe wood brought westward.

Camphor[53]

There are various types, one of which is *zabajī,* its best. It is white resembling salt. Then, there is the *sarbūi* which is next in quality. Then, there is the *dumūb,* then the *irār,* then the *isfaril,* then the *naḥt.* The *naḥt* may be mixed with *isfaril.* Another is the *muṣa"ad*[54] derived from all the camphors; it is not the original substance. All are brought from the land of Sofala in India.

Camphor is a tree gum as related. Once there came down to the perfumers of Basra a piece of wood of the camphor tree resembling the heavy wood of the *zanjīah* tree. Its thickness and its length were two ells, light in weight, and white tending toward red. They split it up and camphor scattered from it similar to white salt. They did not know if it was or was not nard. It is said that this wood that is called camphor wood is named so because the odor in it resembles the odor of camphor. The people of China and others use the wood in the fine arts, and perhaps it is from its wood [the camphor].

Camphor is cold, dry, hot. It arrests many things, and it prevents wounds from stretching and then suppurating.

Saffron[55]

There are various types. The best of these is the *mā'ī,* the washed, thick haired, strongly red, faintly yellow, pure from white, safeguarded from falsification. Then comes the *iṣbahānī*[56] type which is of two varieties —the *qumai* and the *ḥuinī.* The *qumai* is the better of the two, then the type from Raiy, then the Damascene. The latter may have come to Iraq from Andalusia as the Damascene did. The best is when you take the washed, i.e., its hair is washed, and it is made moist with water more

53 *Kāfūr.* Cinnamomum camphora and others. Only a few types are named here of more than a dozen known to the Arabs. There is not much known of their real differences. Jābir p. 117: "This is a cold dry plant which helps in hot ailments. If one takes a little in a cold mixture, then it inactivates the sex organs, makes the nerves weak, depresses the taste feeling, removes warmth from the heart, harms the digestion, tightens breathing, affects the lungs, makes one pale, and changes the color and harms one very much. . . ." It was prescribed in India for sprains and rheumatism. Internally, it is believed to shorten the cold stage of an intermittent fever and is highly useful in typhus. Ainslie, vol. I, pp. 48-51. Ibn Jazla called the types of camphor *al-qaiṣūrī, al-riyāḥī al-azādh, asfarnak.* The latter must be sublimated from its wood; its tree is very large for it can shade more than 100 riders. Wiedemann, *49,* 44-45.

54 A distillation product.

55 *Za'farān.* Probably Crocus sativus L.; *cf.* I.B.L., 1110; *Garbers,* No. 130. Emmenagogue, aborticide. Aphrodisiac since the time of Dioscorides. Mentioned in the Papyrus Ebers. In Akkadian = *šam azupirānu* or *šam azupiru.* For "clove of saffron", *cf.* Levey, *op. cit.* (note 8), p. 105. Ainslie: Hindu doctors prescribed saffron in nervous affections unattended with vertigo and where there is no disposition to apoplexy. It was used in melancholia, hysteric depressions, typhus, and also in ophthalmia when mixed with pounded *kadukāi* (Kabul myrobalan). The Arabs used saffron as a soporific and cardiac drug. *Cf.* Avicenna in *Canon Medicinae,* Bk. II, Tr. ii. For important botanical sections of this work, *vide* Aḥmad 'Isā Bey, *Tārīḫ al-nabāt 'ind al- 'arab.* Cairo, 1944, pp. 55-56. Saffron was frequently adulterated in Arabic times. *Cf.* also Achundow, 'Abd al-Khāliq, *Commentar zur sogenannte Liber fundamentorum pharmacologiae des Abu Mansur Muwaffak-Ben-Ali-el Hirowi.* Dorpat, 1892, p. 80. *Cf.* Garbers, Nos. 17, 18, 23 for recipes for falsification of saffron. Carnoy, p. 87.

56 From Isfahan.

than once, and dried in the shade. Then it is purified from the white and what is similar to it. Then there is the *darūdaḥ* which is purified and not washed. Another type is the *mamsūḥ* which is also called *mad'hūn*. This is what is rubbed with fat of the nightshade to enhance its redness. It softens it. From it comes the *'asīrī* which is that juice becoming more viscous until it sticks together. Another type is the *mu'assal*, that which is heavy and felt-like. It remains so for the duration of the journey and transportation. Then there is the type whose hair is dead, with full yellowness, and whiteness which is worse.

Saffron is good for the liver and stomach, similarly for all the humours or for their natures.

Secondary Aromatics

Nard[57]

There are various types. The best of these is the Indian nard[58] which, if you rub it in the palm of the hand, gives off the odor of apple or something like it. Then that which comes next to it is the *ṣafār sunbul*[59] which has much whiteness and a good odor nearly that of the first. Then the most inferior is fine and gross, and taken from water which does not have a good odor. It is a grass brought from India, and it is in the land of Tibet. It is all disposed of in liquid aromatics for women. It is good for the liver and stomach, saves one from fever, and its heat is less, and it is less dry.

Clove[60]

One kind. Its best is arid dry with a sweet, good odor. It is the fruit of a tree which comes from Sofala. It is introduced into liquid aromatics for women and into the cooking of nutmeg. It is hot, gentle, good for the stomach and fainting, a vomiting condition caused by the damp humour, and for some of the liver ailments that entail putrefaction and the damp humour.

Sandal[61]

There are various types. The best of them is yellow, heavy, with no cavities, and dull as if it had been rubbed with saffron. It is a sweet

[57] Garbers, No. 109; I.B.L., 1237. *Sunbul* is reputed to be an aphrodisiac. *I.B.* used in the Indian nard; others as Ibn Sīnā and Abū Manṣūr used the Greek nard. *Cf.* also Garbers, No. 5; Wiedemann, *49*, 40; Maim., No. 265. Cognate in Akkadian to nard is *šam lardu*. Used in a collyrium, Ḥunain, 200 *Ar.* and 211 *Ar.*

[58] *'Aṣāfir*. Nardostachys Jatamansi D.C.

[59] A yellowish type of nard. Wiedemann, *49*, 40. Ibn abī Ya'qūb gives the *'aṣāfir* as red, and the *musalla* as red with much white and gray in it—as quoted in al-Nuwairī (1279-1332) *op. cit.*

[60] Not listed in Maim. In Awwām, vol. II, pp. 392-393, it is given as Eugenia caryophylla. Qurra has "carnation." *Cf.* Wiedemann, *49*, 40-42; Garbers, No. 90; I.B.S., vol. I, pp. 404-407. To the Arabs, clove was known as a tonic (Garbers, pp. 299-307) and used in many compound remedies. The native doctors of India considered it as a stimulating aromatic. Ainslie, vol. I, pp. 75-77. In the 18th century in France, it was used to preserve the gums and teeth.

[61] I.B.S., vol. II, pp. 138-139 lists three kinds—white, yellow, and red. Used for headache and feverish conditions. Achundow, *op. cit.*, p. 89. In the East sandalwood aromatics were considered efficacious for vertigo and palsy. Ainslie, vol. II, pp. 376-378.

aromatic of the Indian people. Then, after it comes the white sandal which is white in appearance, aromatic in odor, and not like the first. Then there follows a sandal which is yellow and red, and has a strong odor. It is the strongest in odor but it is not sweet. Then there is the red sandal which is not for aromatics because it does not possess an odor. All these are brought from Sofala. It is wood like the *zābajī*, very large and small pieces. It is introduced into moist and dry aromatics for women, and in everything of an aromatic nature except body perfume, ambergris, "death salve,"[62] musk mixture, and in what resembles these.

Nutmeg[63] *and Fennel*[64]

They are equal as aromatics except in a minor way. The fennel is a leaf. The nutmeg is one of the weaker ones; it has a convex leaf with a lattice similar to the rose; this distinguishes it from the former. Often it is brought in its original shape so that it is interesting and is used in ornamental neckbands. It is brought from Sofala. It is introduced into liquid aromatics for women and is used in cooking of the ben-nut.[65]

Rose[66]

There are two kinds, the moist and the dry. The best moist rose is that which is in hollows in the land of Jundishapūr.[67] That which is used of the dry comes from Māsyān. All of it is red. The rest of the moist and dry roses is not employed, yet they are good for color and reddening. The latter

[62] A medicine made of particles of calamus aromaticus, etc.

[63] Corruption of the Persian *gawz-i-būyā*. Ghāf., pp. 391-393. Still used as an aphrodisiac in the Near East. It is a constituent of many tinctures. Myristica fragrans Houtt. is sold in Egyptian bazaars today and is used as a stimulant with tea. In large quantity, it produces stupor and drowsiness. Maim., No. 71. The Arabs used it among their hepatica and tonica. In 18th century India, nutmeg was used in dyspeptic complaints as a cardiac and corroborant. Ainslie, vol. I, pp. 249-50.

[64] *Bisbās*. Name used in Maghrib for fennel. In Gr., *márathon*. In the Near East it is called *rāziyānaj* and in Egypt, *shamār*. A strong carminative. Maim., No. 351; Diosc. W., vol. III, p. 70; Theophrastus VI; Awwam, vol. II, pp. 250ff. Perhaps Anethum foeniculum L. in India it was used as a stomachic and to promote lactation. The root is aperient and the leaves diuretic. Ainslie, vol. I, pp. 129-130.

[65] *bān*. Ghāf., pp. 254-256. Used in a cataplasm for gout, and removes scabs when applied with vinegar. The shell is very astringent. Maim., Nos. 378. It is used by women to acquire plumpness since ben-nut is very rich in oil.

[66] Ghāf., pp. 565-567. In Diosc. W, vol. I, p. 99, used as a collyrium. Arabs used it in purging, as an aphrodisiac, stomachic, for the heart, eyes, in cephalica and tonica. Petals were used in India as a laxative for infants. Ainslie, vol. I, pp. 345-348. There are numerous terms for rose in Arabic and Persian.—*cf.* Maim., No. 121, No. 85; Theophrastus VI. In Gr. = *rhódon;* Persian = *gul*, the first part of our word julep; Turk. = *verd;* Sumerian = ^{ta}GESTIN-GIR (RA) = "vine + thorn" = rose; Akkadian *šam amaridu* (thorn) = *ward* in Arabic. Rose oil was frequently used as a vehicle in many remedies. Rose water was also used, as for example in the following prescription to be found in Berlin, Arabic MS. 5567, fol. 54b, 18ff.: "That which arrests intercourse. Take vitriol (*qalqand*), and seed of cucumber, and seed of burned round cucumber, and seed of lettuce, and purslain-of each one a part. Pulverize it all well and knead with water of rose, and make it into pills. It is dried in the shade. When you wish to use it, mix it in the mucilage of the cotton seed and cover the penis every week. Then desire dies. It is good for all that is acidic, and for anxiety, and fasting, and all serious confusion. The desire is killed." The author is Abū'l Qāsim Aḥmad al-'Irāqī (13th cent.), from the text of his *'Uyūn al-ḥaqā'iq wa-īḍāḥ al-ṭara'iq*.

[67] In the text, it is shortened to *shābūr*. This was frequently done then as it is today.

is brought from other districts. The rose is employed in general aromatics for women, cooking of the ben-nut, and in improvement of oils. It is cold, contracted; it is medium but tending toward coldness. It is good for the stomach, the liver, and the rectum and its curing.

Falanjah[68]

There are various types. The best is the red, heavy, thick-stemmed which has the odor of apple. Also, there is the light, with abundant leaves, thin stems, which resembles the best in some of its odor. It is a fruit like the mustard.[69] It is brought from Sofala. It is used in liquid aromatics for women and in cooking of ben-nut.

Zarnab[70]

There are various types. There is the good one, pleasant in odor like the odor of the citron. Then there is that called the Bokharan, like it in appearance but not used in aromatics since it has no odor. One falsifies with it, and it is sold as if it were the good type. It is used in liquid aromatics for women. It is a thin leaf.

Cinnamon[71]

There are various types. The best is the clove bark whose odor resembles that of cloves. It is sweeter than the clove and is used in liquid aromatics for women. Then there is the cinnamon whose odor resembles that of camphor; it is used with alkali ash for the hands. Then there is that whose odor is similar to Chinese cinnamon but it is not good. It is used in alkali ash and is the bark of a tree which resembles the Chinese cinnamon.

Indian Pepper[72]

It is a seed smaller than the pepper, dust colored, sweet, similar to the odor of Indian aloe wood. It is employed in liquid aromatics for women. It comes from Sofala, India.

Cardamom[73]

It comes after Indian pepper in goodness of odor; it resembles the

[68] Maim., No. 137. Uncertain—*vide* note 17; I.B.S., vol. II, p. 261. Ibn Amrān is quoted as saying that it is hot and dry, opens constrictions in the head, strengthens the brain, and is an antidote to scorpion bites. If it is bindweed, then it had an important place in the 18th century Indian pharmacopoeia as a cathartic. Its root was used in dropsy. Ainslie, vol. II, p. 307.

[69] *Ḥardal*. Awwām, vol. II, p. 252; Diosc. W., vol. II, p. 254; Theophrastus VIII; Jabir, p. 4 where *ḥardal* is used to make an elixir.

[70] Maim., No. 137. Related to *falanjah*. Identification uncertain. *Vide* note 68. *Cf.* Wiedemann, 56, 329, who gives Taxus baccata after Guigues, and Flacourtia cataphracta after Leclerc.

[71] *Cf.* Diosc. G., vol. I, pp. 15-16, where there is much confusion as to identification; Maim., No. 95; Ghāf., pp. 471-475; note 60; Carnoy, p. 82.

[72] Vocalized as *haranwat* in I.B.S., vol. II, pp. 569-570. It is useful for pain in the neck and softens the muscles.

[73] I.B.S., vol. I, p. 273. Cardamom comes in two types, small and large. The Arabs used the peel and tips as astringents, to aid digestion, for pain of the cold liver, and for phlegm in the chest. *Cf.* Maim., No. 116. Also used as a cardiac drug. Perhaps it is *šam Kudimeru* in *Akkadian*, used for eyes, cavities in teeth, and as a stomachic.

odor of camphor. It is introduced into aromatics for women. It comes from Sofala. It is a particle resembling the large chick pea together. When it separates, it becomes a small particle like wheat. It tends toward cold; it is considered as the beginning of warmth. It is good for the stomach.

Cubeb[74]

It is like pepper[75] in appearance. It is inferior to cardamom. Its odor resembles that of sisymbrium.[76] It is introduced into liquid aromatics for women. It is brought from Sofala and is superior to cardamom in the warm nature.

Small Cardamom[77]

It is like the thin part of the crushed cardamom. Its odor is close to that of the cardamom. It is employed in perfume for women. It comes from Sofala and is stronger than cardamom and better than it for the stomach.

Seed of the Mīsam[78]

It is a seed like the seed of the terebinth, dust colored with redness in it, with an aromatic odor. It is employed in aromatics for women. It comes from Sofala.

Agnus-castus[79]

It is a seed like the seed of the small chick pea. Its skin is hard as the skin of the prune. In its interior a black seed is suspended, like hemp and a little larger. It is employed in aromatics for women. It comes from Sofala.

Mahlab[80]

The best of it is the white, like pearl, sweet of odor. It comes from Aizerbaijan and Nahāwand. It is employed in liquid aromatics for women for washing.

True Wurus[81]

It is from Yemen. There are various types. The best is the red in which one may not see any other color than red and wine color. It is

74 Used as a diuretic, and to dissolve calculi. Has a bad effect on the alimentary tract. Achundow, *op. cit.* pp. 99, 100. Used in India as a stomachic and carminative. It was considered highly efficacious in gonorrhea in Europe. Ainslie, vol. I, p. 98; Ghāf., pp. 541-542.

75 *Fulful.*

76 *Sīsanbar.* Maim., No. 255. Possibly Thymus glaber Mill., T. Serpyllum Fries, or the peppermints as Mentha sativa L.

77 *Cf.* Maim., No. 116, *buwwā*=aroma in Persian; *hāl* comes from *ēlā* in Sanskrit; I.B.S., vol. II, p. 568.

78 Undetermined. Listed in I.B.S., vol. II, pp. 541-542.

79 Maim., No. 307; I.B.S., vol. II, p. 241. Used in gout, and as a tonic and febrifuge.

80 Awwām, vol. II, p. 367. It is a vermifuge, cough reliever, lithontriptic. Probably Prunus Mahaleb L. or Cerasus Mahaleb Mill.

81 Garbers, p. 376. Probably Flemingia rhodocarpa Bak.; Ghāf., pp. 568-571. Used for leucodermia (*bahaq*), itch, pustules, psoriasis (*sa'fa*), and eczema (*qūbā*) in the form of an ointment. Still used for skin disorders in the Near East.

called *bādirah*.[82] Then there is the inferior one which contains a definitely seen white. The seed is like the *māsh*[83] except that it is black. It is much falsified. It is not known to us. It is something that is in a tree and is shaken into a leather container when it falls. It is said that it comes out from the tree, and it is said that it falls on the tree and is brought about from moisture and air.

Costus[84]

It comes from Abyssinia. There are various types. There is the sweet of which one says it is the *baḥrī* type. The best of it is the white which has a thin skin. It is like the fingers or larger as though it were the dry, split carrot. Some say that the people of India eat it moist in their country. It is put in incense. Then there is one with a heavy odor called *rīfl*. It is weak and is put in incense. Then, there is the *murr*,[86] also coming from India, white, and one type tending toward black, and both of them are used in incense.

Ungues Odorati[87]

There are various types. There is the *māshmahīyah*[88] which comes from Bahrein;[89] it is the best. It is put in incense. Then there is the Meccan, its inferior. It is not used in incense. It is skin-like, slowly creeping in the sea; it may be considered as the mussel bound with flesh which is peeled from its place. It tends to red. It is found on the coast of Jiddah and in the vicinty of Bahrein. It is dealt with after it is boiled with something you can insert into it. It becomes odoriferous.

Bunk[90]

One type comes from Yemen. Its best is the light yellow, aromatic of odor. The white is not good. Some say that it is acacia gum.[91] It falls down there and it is worm-eaten. It comes from the roots of its plant. It is put into dry aromatics for women. It resembles the worm-eaten interior of the palm leaf.

82 Persian = lettuce?, Steingass.

83 Possibly Phaseolus maximus or mungo. *Vide* I.B.S., pp. 465-466; Awwām, vol. II, p. 67. Good for coughs, catarrh, fever sicknesses, nose sores. *Cf.* Talmud Babli, Barochat 45.

84 Sanskrit *kuṣṭha*. Ainslie, vol. II, pp. 165-166. Various species were used in India as a stomachic, tonic, and in the last stages of typhus. *Cf.* Diosc. W., vol. I. p. 16; Theophrastus IX.

85 Coming from the sea or near it.

86 A bitter product.

87 *Aẓfār* may be equivalent to *aẓfār al-tibb*, derived from the operculum of the gastropods Murex inflatus, Strombus lentiginosus, etc. It is still sold in Cairo as a laxative and for fumigation. *Cf.* Ghāf., p. 224.Diosc. W., vol. II, p. 8, Maim., No. 15.

88 A kind of shellfish? (Persian).

89 A district on the east coast of Arabia on the Persian Gulf.

90 Undetermined. Ghāf., pp. 256-259. Used in fumigation and also for the stomach and liver. In I.B.S., vol. I, p. 180, it is listed as nascapthon, a bark similar to the bark of the mulberry. *Cf.* Diosc. G., vol. I, p. 22. Māsawaih, however, states that it is a root. Perhaps it is Acacia gummifera Willd.—Garbers, No. 20. Steingass gives Acacia nilotica in Persian.

91 *Umm ghailān*. Diosc. W., vol. III, p. 13; Theophrastus IV; Maim., No. 278.

Lentisk[92]

A gum which comes from Yemen. It is the gum of a tree. Some say it is the *kamkām*[93] which is its covering. It is put into dry aromatics for women; so is the lentisk.

Laudanum[94]

It comes from Syria. There is the type which is black like pitch. Then there is the dry type. Its odor is similar to that of ambergris. It is put into incense for men and women.

Storax[95]

There are various types. There is the clear, refined, flowing red. Then there is the good white which comes in different ways from wood. Storax is perfumed with ambergris. Then there is the storax of musk which is inferior to it [i.e., the former]. Then there is the white similar to the wax of honey which comes out from the residue of the red fluid. It is clarified. Then there is the residue of the storax which is called liquid storax. It is inferior to all the former ones. All together are put into dry and liquid aromatics for women except the smallest quantity of them. It comes from Syria and is from a tree whose dry part is a gum and whose liquid part is extracted from the tree, cooked, and worked. In it, there is bark like the bark of the tree and its inner bark.

Kamala[96]

It is like the true *wurus* except that it has no odor and its color is weaker than that of the true wurus.

[92] It provides the gum called mastic. Mastic is also the name sometimes applied to the lentisk tree. In India it was used as a hepatic, tonic, and astringent. Ainslie, vol. I p. 215. Akkadian = *ṭiru, ṭuru,* and *ṭurū*. Aramaic = *ṭurā*.

[93] Cancamum. Compare with Sumerian riqGAM-GAM, DAB. p. 264. Used in Sumerian and Akkadian medical texts for the teeth, temples, breast, cough, feet, swelling, for the tip of the penis (probably in gonorrhea), and in blains.

[94] In India, it was used for stomach spasm and flatulence. Ainslie, pp. 187-188. The Arabs used it also in fumigation, as an astringent, anti-dysenteric, and in collyriums. *Cf.* I.B.S., vol. II, pp. 409-410; Diosc. W., vol. I. p. 97; Theophrastus VI. In Akkadian, it is *ladunu;* this does not occur in medical texts.

[95] The Arabs distinguished between the dry storax, styrax officinale L., and the Liquidambar orientalis Mill. (*lubnā*). *Cf.* Garbers, pp. 255-259; Diosc. W., vol. I, p. 66 (*styrax*); Theophrastus IX; I.B.S., pp. 539-540. Storax was used in 18th century India as a stimulant and expectorant. Ainslee, vol. I, pp. 405-457. Storax was used by the Arabs for numerous compound remedies for the spleen, against poisons, in pain of fractures, for the chest and coughing, in clysters, for boils on the male genitals, and for the bladder. In Ḥunain, p. 153 Ar., it is used as a collyrium.

[96] Found in India. It is a red powder obtained from the tropical plant "rottler of the dyers" (Rottler tinctoria Roxb.). It is formed from the projecting glands which have a resinous content of a yellow red color. Often the powder contains about 80 per cent earth and so was called an earth by the Arabs. It was also known to them as a manna which fell in Yemen and India. It is often confused with *Wars*—Maim., No. 237. It is a purgative and anthelmintic.

Thus the Book of Yūḥanā b. Māsawaih on Simple Aromatic Substances is finished in the hands of Archdeacon Yūḥanā ibn ʿAbd al-Masīḥ of Antioch in the town of Aleppo on the 3d day of the month of Muḥarram in the year 971 A.H. Praise God forever.

Abbreviations

Ainslie. W. Ainslie. *Materia Indica*. London, 1826, 2 vols.

Abū'l-Qāsim. Abū al-Qāsim Aḥmad al-ʿIrāqī. *ʿUyūn al-ḥaqā'iq wa-iḍāh al-ṭarā'iq*. Unedited MS Berlin Arabic 5567; Wetzstein II (375).

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Bayān. Ibn abī Bayān. *Al-dastūr al-bimaristān*. Ed. by P. Sbath. *Bull. Inst. Égypte*, 1933, *15*, 13-78.

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DAB. R. C. Thompson. *A dictionary of Assyrian botany*. London, 1949.

Diosc.G. *The Greek herbal of Dioscorides*. R. T. Gunther, Ed. Oxford, 1934.

Diosc.W. Pedanius Dioscorides. *De materia medica libri quinque*. Greek. M. Wellman, Ed. Berolini, 1907, 3 vols.

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GAL. C. Brockelmann. *Geschichte der arabischen Litteratur*. Weimar, Berlin, 1898-1939. 2 vols. plus 3 suppl. vols.

Garbers. Karl Garbers. *Kitāb kīmiyā' al-ʿiṭr wat-taṣ ʿīdāt*. Leipzig, 1948.

Ghāf. Abū Ja'far Aḥmad b.M. al-Ghāfiqī (d. 1165). *Kitāb al-adwiya al-mufrada* (*Book of simple drugs*). Abridgement by Bar Hebraeus. Ed. and trans. by M. Meyerhof and G. P. Sobhy. Cairo, 1932-1940.

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Ḥunain. Ḥunain ibn Isḥāq. (*c.* 809-877). *Kitāb al'ashir muqālāt fi al-ʿayīn* (Ten treatises on the eye). Ed. by M. Meyerhof. Cairo, 1928.

I.B.L. Ibn al-Baitār (d. 1248). *Kitāb al-jāmiʿfī al-adwiya al-mufrada* (Book of the collection of simple drugs). Trans. by L. Leclerc. Paris, 1877-1883. 3 vols. The number of the article is cited.

I.B.S. Same as previous but edited by J. Sontheimer. Stuttgart, 1840. ʿIsā. Aḥmed ʿIsā Bek. *Tārīḫ al-nabāt'ind al-ʿarab*. Cairo, 1944.

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LIST OF ARABIC AROMATIC SUBSTANCES AND SOME RELATED ADJECTIVES

'anbar
'aṣāfir
'asīrī
azādh
azfār
azfār al-ṭibb
bādirah
bān
bashās
bunk
burank
dar ṣīnī
darūdaḥ
darw
dharīra
dumūb
faghirah
falanjah
fulful
hāl bawwāh
haranwat
ḥardal
harnawah
ḥuinī
irār
isfaril
jalā'ī
jawz bawwā
jundabādustur
kabbabah
kāfūr
kamala
kamkām
lādhan
lubnā
lūkīnī
maḥlab
mā'ī
mai'ah
mamsūḥ
mand
mandalī
mantā'ī
māsh
māshmahīyah
misk
mīsum
mu'asal
musalla
naḥt
qaiṣūrī
qāqullah
qāqulī
qaranful
qarnuwa
qaṣfī
qīrfah
qumai
qumarī
qusṭ
rāziyānaj
rīfl
riyāḥī
ṣafār sunbul
salāhaṭī
samandrūn
ṣandal
ṣanfī
sīsanbar
sunbul
'ud
umm ghailān
ward
wars
zābajī
za'farān
zarnab

Charles Joseph Singer
M.A., D.M., D. Litt., Hon. D. Sc. Oxon, F.R.C.P.*

EDWIN CLARKE**

I FEEL sure that there are several here who knew Charles Singer better than I did, and for a longer period of time. I am therefore grateful to be allowed to add my tribute to his memory.

The English summer of 1959 was unusually brilliant; even in early October the end did not seem to be in sight. We took the Cornish express from Paddington and by mid-afternoon had arrived at the little station of Par. Soon we were approaching the old manor house of *Kilmarth* standing high above the sea. We were paying what proved to be our last visit to Charles and Dorothea Singer.

Charles Joseph Singer[1] was born in London on 2 November 1876 and, being within the sound of Bow Bells, could legitimately claim that he was a true Cockney. His father, a distinguished Hebrew scholar and minister, saw to it that his son began the study of classical languages at an early age. After leaving school he studied pre-medical subjects at University College London, and then zoology at Oxford for three years. In 1903 he qualified from St. Mary's Hospital Medical School and, after visiting Abyssinia as medical officer to an expedition, he began the practice of clinical and experimental medicine in London. The year 1910 was crucial, for during it he married Dorothea Waley Cohen, and gradually his interest now turned more and more to the history of medicine. Giving up practice at the age of 38, he went to Oxford in 1914—at the invitation of Sir William Osler—and after four years in the Royal Army Medical Corps he went back there as Lecturer in the History of Biology. In 1920 he returned to University College London as Lecturer in the History of Medicine, and in the 1930-1931 session was elected to an honorary chair in this subject. He retired in 1942 at the age of 67 with the title of Professor Emeritus.

* Read at the annual meeting of the American Association for the History of Medicine in Chicago, Illinois, on 19 May 1961.

** Johns Hopkins University School of Medicine, Baltimore, Maryland.

1 Use has been made of obituaries written by Sir Zachary Cope (*Bull. Hist. Med.*, 1960, *24*, 471-473) Dr. A. Rupert Hall (*Isis*, 1960, *51*, 558-560), and Dr. E. A. Underwood (*Med. Hist.* 1960, *4*, 353-358); also the biographical essay and bibliography in *Science, medicine, and history. Essays on the evolution of scientific thought and medical practice written in honor of Charles Singer.* Collected and edited by E. A. Underwood, London, Oxford University Press, 1953. Vol. I, pp. v-ix, and Vol. 2, pp. 556-581 respectively.

Singer came to the United States in 1930 and 1932 as Visiting Professor at the University of California at Berkeley. During these visits he gave a series of lectures at the new Institute of the History of Medicine of the Johns Hopkins University in Baltimore as well as lectures in other eastern cities.

From 1934 onwards the Singers wintered in Cornwall, mainly on account of his health. There they amassed a remarkable working library, some of the contents of which are listed in a recent Sotheby catalogue.

Charles Singer's professional activities can be divided into two periods. First of all, his investigations in clinical and experimental medicine, carried out between 1903 and 1914 and recorded in 13 papers.[2] He investigated cancer, gastric secretion and ulceration, and he devised a portable method of recording graphically the diastolic blood pressure. Although this work is rarely referred to today, an examination of the papers indicates that Singer had already developed the ability to present his material in an attractive and effective manner, both by his literary style, and by the use of appropriate illustrations.

The second phase, his work in the history of medicine, science, and technology, began in 1910 in a second-hand book shop where he found a copy of Marten's *New Theory of Consumptions.*[3] It ended exactly 50 years later on 10 June 1960 in his 84th year in a bedroom of his Cornish home.

There are at least three factors which determined his change of discipline: his scholarly upbringing, the copy of Marten's book just mentioned, and, probably most important of all, his marriage to Dorothea Waley Cohen who was herself a scholar of repute. Thus began a literary partnership which was to endure for the rest of his life. His first historical papers appeared in 1911[4] and during the ensuing half century he was the author of more than 420 literary items. About half of these were book reviews, many containing new and critical material. Altogether he published 21 books, either alone or with a co-author, and edited and contributed to several extensive series.

From 1910 to about 1930 was his most active phase. His interest in Hildegarde of Bingen took them to Germany on two

[2] *Science, medicine, and history.* London, Oxford University Press, 1953. Vol. 2, pp. 555-556: Numbers 1, 2, 3, 4, 9, 10, 12, 13, 14, 15, 16, 17, 21.

[3] Marten, Benjamin. *A new theory of consumptions: more especially of a phthisis or consumption of the lungs.* London, R. Knaplock, 1720.

[4] A forgotten prophecy of the microbic theory of infectious diseases. *Lancet,* 1911, *1,* 684-686. Benjamin Marten, a neglected predecessor of Louis Pasteur. *Janus,* 1911, *16,* 81-98.

occasions, and during the First World War, while stationed in Malta, he did archaeological work with the Hon. T. Zammit and later, when in Salonika, he studied Byzantine medicine. Meantime, at home Mrs. Singer dealt with the manuscripts, photographs, and proofs of the various books and papers he was already turning out. The first volume of *Studies in the History and Method of Science,* which he edited, appeared in 1917 and the second in 1921. In Oxford he and Mrs. Singer equipped a room for the study of the history of science, mainly at their own expense, and when he was installed in University College London he collaborated with some of its many well-known scholars, enjoying immensely the stimulating atmosphere he found there.

His main interests now, and indeed throughout his life, were the history of anatomy, Greek biology and medicine, medieval medicine and science, including Anglo-Saxon medicine, and early herbals.

It was his idea to commence the "Legacy" series of the Clarendon Press, Oxford, and he and his wife contributed to three of the volumes. His *Evolution of Anatomy,* given as the FitzPatrick Lectures of the Royal College of Physicians of London for 1923-1924, appeared in 1925 and has remained a popular work, as has *A Short History of Medicine* (1928) despite many more recent competitors. These were followed by *A Short History of Biology* in 1931 which ran into three editions, with French and Spanish translations; it was based on his lectures in Berkeley in 1930, and he always considered it his best book. Also in the late 1920's he drafted *A Short History of Science to the Nineteenth Century* but, for reasons we shall see, it did not appear until 1941. It was reformed and retitled *A Short History of Scientific Ideas to 1900* in 1959. Of this early work in general, he considered his papers on Hildegarde and on early herbals to be his most important contributions.

Towards the end of the 1920's an interest in religion, and in particular its relationship to science, and in Judaism, was becoming more prominent and during the 1930's and up to the end of the Second World War, there was a lull in his historical work. This was, however, by no means a period of inactivity. After the creation of the Third Reich, he was very distressed by the fate of German scholars and, like his father before him, he gave practical evidence of his feelings by contributing from his own pocket. In 1934 he wrote in a letter:

"I must send the poor fellow a few pounds but my power to help will not last out much longer. In fact assistance to German refugees has been the largest item of our expenditure in the last year. . . . It is all very dreadful."[5]

The decline in his literary output is obvious, and in 1933 he wrote: "I am engaged on the proofs of my *History of Science*. But I give very little time to them for almost all my time is taken up with work for these unfortunate émigrés for whom some sort of accommodation has to be provided."[6]

Another deterrent to his work was the Second World War during which both he and his wife contributed to the war effort by busying themselves with local activities. He set up a laboratory in his home and taught biology to evacuees.

Singer had retired from his chair in 1942 at the age of 67 and, as the war ended, another period of activity began—an Indian summer comparable with his heyday of the 1920's. His interest in Vesalius was renewed, and his books on the *Tabulae Anatomicae Sex* (with C. Rabin) (1946) and *Vesalius on the Human Brain* (1952) resulted, with a number of smaller publications as side-products. The much-delayed *Anglo-Saxon Magic and Medicine*, written in collaboration with Professor J. H. G. Gratton, appeared in 1952, and a translation of Galen's *De anatomicis administrationibus* in 1956. Throughout this period he was reconstituting and re-editing his earlier books[7] and at his death was planning a new history of anatomy extending up to the modern period.

A book written in 1948 on the alum trade[8] led to the idea of a comprehensive study of the history of technology, and he became chief planner and editor of a five-volume work which he said "afforded me a belated apprenticeship which remains among the most intellectually rewarding experiences of my not very

[5] Letter dated 30 January 1934.

[6] Letter dated 5 August 1933.

[7] (i) *A history of biology. A general introduction to the study of living things*, London, H. K. Lewis, 1950, is a revised edition of *A short history of biology*, Oxford, Clarendon Press, 1931. (ii) *A short history of anatomy from the Greeks to Harvey*, New York, Dover Publications, 1957 (the title on the cover is *A short history of anatomy and physiology from the Greeks to Harvey*), is a revised edition, with soft back, of *The evolution of anatomy*. London, Kegan Paul, Trench, Trubner & Co., 1925. (iii) The revised edition of *A short history of science to the nineteenth century*, Oxford, Clarendon Press, 1941, appeared as *A short history of scientific ideas to 1900*, London, Oxford University Press, 1959.

[8] *The earliest chemical industry. An essay in the historical relations of economics and technology illustrated from the alum trade*. London, The Folio Society, 1948. 337 pp.

short life."[9] Posterity will judge this to be one of his greatest contributions.

One of his last major tasks was a history of the University College Hospital Medical School but he did not live to complete it, nor to carry out a plan of publishing an expanded version of his classic *The Herbal in Antiquity*.

In addition to his professional activities, his intense interest in Cornwall and its beautiful countryside should also be mentioned. It attracted him as a biologist, and he carefully observed the flora and fauna around him. He stimulated others also, and in the famous Visitors' Book at Kilmarth, Sir Julian Huxley has recorded the birds he observed there during a few days in 1959, with a note below saying "By request." Furthermore, Singer and his wife identified themselves with Cornish life and causes, and a corner of their library was devoted to books on the county. He liked to think the name of his house, *Kilmarth*, contained a reference to King Mark, and a neighbour, Dr. A. L. Rowse the Oxford historian, has written charmingly on this less-well-known aspect of the Singers.[10]

Singer's breadth of knowledge was immense, ranging over much of the history of medicine, of the biological sciences, and of technology, in addition to many other related fields. He also kept in touch with recent advances in science and never missed a copy of *Nature*. He always regarded himself as a biologist fundamentally, as is clearly seen from his training, from his special attraction to the history of biology, and from the fact that he elected to teach the subject during the Second World War. Throughout his life his tastes were catholic and his activities multi-directional; thus he earned from Osler the epithet of "that Socratic gadfly." Perhaps this trait may explain why he has left no single monument of scholarship. He rarely ventured past the Renaissance in his detailed work, and wrote almost nothing on the 18th and 19th centuries. He used to say that only once were his sources all in English, and this was the uncompleted history of the University College Hospital Medical School.

One may perhaps accuse him of being repetitive in his publications, and of deriving the maximal benefits from his initial research on a problem. This was true to some extent, but he was forever expanding, and the fact that certain themes interested him

[9] *A short history of scientific ideas to 1900*. London, Oxford University Press, 1959. P. vii.

[10] *The Times*. 15 June 1960.

throughout his long life may account for some of the apparent repetitions. Nevertheless, he can be criticised for occasionally publishing hastily and then not revising adequately. Also, in some of his translations he at times took liberties by giving a personal interpretation of a passage without indicating the deviation from what might have been a more universally acceptable version. On the whole, he received more censure in his later years, for as the aging process did not affect his intellectual equipment, he was able to continue his work into a new generation of scholars—and of criticism.

Concerning the mechanics of his writing, he said that he had no system. He had no file cards and no elaborate indexing schemes, but this was because he did not need them. His brain performed this function right to the end. And, of course, he had Dorothea who helped him in all his work, and he never failed to make public acknowledgment of this assistance.

In addition to his remarkable memory, his linguistic abilities, and his wide spectrum of learning, he had an enviable facility for marshalling a host of diverse facts into a masterly and readily understandable synthesis. One of his greatest assets was his clear prose style, effective whether relating the progression of ideas, or giving a sequence of factual information. This can be seen particularly in his general surveys, the *Short History of Medicine* being an especially good example. At a very early stage in his writing career, he was able to handle penetrating comments in an attractive manner. Thus in 1912 when discussing the origin of syphilis, he wrote: "The final responsibility has been left with the poor Indian inhabitant of the Western Isles [i.e. the West Indies], whose exclusion from the republic of letters has prevented his views from reaching us."[11]

It is too early to make a full evaluation of Singer's contribution to medical history, but certain comments are permissible. In 1919 he set forth his ideas on the teaching of medical history, and began thus: "England is almost the only country where there is no adequate provision for the teaching of medical history."[12] The fact that 42 years later the position in Britain is much the same, indicates that, despite his efforts, Charles Singer failed to establish his subject there as an academic discipline.

[11] Note on some early references to tropical diseases. IV. André Thevet on the identity of yaws and syphilis—1558. *Ann. trop. Med. Parasitol.*, 1912, *6*, 381.

[12] The teaching of medical history. *Brit. med. J.*, 1919, *2*, 141-142.

It has been said that Singer "founded a school of historical research in Medicine and Science"[13] but even accepting the word "school" in the broadest sense, it is difficult to know where or what this is. He certainly gave guidance and advice unselfishly, and he inspired and encouraged many. In this respect, a *Festschrift* of 95 essays published in 1953[1] demonstrated the gratitude and respect of friends and former colleagues.

But he trained no professional historians of medicine, and when he retired in 1942, his title lapsed and the Department of the History of Medicine likewise disappeared. No doubt some of the factors responsible for this were beyond his control. However, apart from a few important collaborations, Singer was a one-man show, or rather a one-man-and-his-wife show, a symbiosis which functioned admirably. This, and the fact that for health reasons he could spend only half the year in London, must have made the establishment and running of an active department difficult, if not impossible.

His life's work consisted, firstly, of detailed investigations of the history of medicine and of science, in Graeco-Roman antiquity, in the Middle Ages (including Anglo-Saxon medicine), and in the Renaissance, including translations of important anatomical works. For these contributions alone, scholars will continue to be grateful. But he also wrote or edited a number of more popular and general surveys intended for wider audiences. For these efforts to popularize his discipline in a scholarly fashion, we should all be grateful.

His general influence on the fields of medical history and the history of science was such that it is comparable with that of his famous contemporaries and friends—Sudhoff, Sigerist, and Sarton.

As a medical student he has been described as "a merry fellow"[14] and this was certainly true of him in his later years. He had a keen sense of humor, and his characteristic chuckle and pink impish face must be remembered by many. He was a brilliant conversationalist and his talk was interspersed with amusing and pertinent anecdotes. He enjoyed telling them as much as his listeners enjoyed hearing them. An example of this also includes a criticism of the narrow-minded classicist. Whilst discussing certain individuals, he leaned forward in his big wing armchair and

13 MacNalty, Sir Arthur. [Obituary notice on Charles Singer] *Lancet*, 1960, *1*, 1355.
14 Cope, Sir Zachary. Charles Joseph Singer (1876-1960). *Bull. Hist. Med.*, 1960, *34*, 473.

said "You know, I think that some classical scholars are humbugs!" and he then told the story of Charles Darwin and his grandchildren. They had been playing in the garden and decided to tease the old man. They took a dead grasshopper and somehow fixed to it the wings of a butterfly, and taking it to Darwin asked him gravely what kind of creature this could be. He examined it carefully and replied, equally gravely, "I think it is some kind of bug. Yes, a humbug!" Similarly, Singer delighted in relating amusing incidents he encountered during his editorial work for *The History of Technology*.

Throughout his life Singer had a boyish enthusiasm which pervaded his work and also his letters, of which he must have written thousands. Even in the last months of his life he had a multitude of plans for new projects. His kindness and warmhearted nature, which he shared with his wife, were amply demonstrated by hospitality offered freely, by his unselfish assistance to German emigrés, and by his readiness to give professional advice to all who approached him, even the lowliest neophyte.

When discussing the great historians of technology, Frémont and Dickinson, Singer writes as follows, and I think it appropriate to turn this back on the writer:

> "Such singleness of purpose, such learning, such skill, such penetration, such a constant search for clarity, inevitably affect the character of those who exhibit them. The contemplation of their lives induces a reflection on the effect on these fortunate and happy men of the single-minded pursuit of truth. The mood in which such men approach their tasks is surely derived from something very near to 'that subtle, lively, clear and undefiled thing that is more moving than any motion and goes through all things by reason of her pureness, yea, wisdom, which is the artificer of all things, wisdom that in all ages enters into pure souls.'[15]

Dr. Rowse, whom I have already mentioned, reminds us[16] of the ever-welcoming hospitality and good talk in that kindly house with the wonderful view across St. Austell Bay to the Black Head and beyond. Several here, and many others in this country and in Europe, will have reason to remember them. I recall, in particular, my last visit to Kilmarth.

We had talked all day of Vesalius and of many other matters and, as evening approached, we walked into the field in front of the house and overlooking the Bay. There was a vivid sunset

[15] *Technology and history* (L. T. Hobhouse Memorial Trust Lecture). London, Oxford University Press, 1952, p. 19.

[16] See note 10.

and the sun swung down the sky to what seemed to be a watery grave. The old man stood with us, the westerly, salt-laden breeze which he loved so well blowing his white hair in confusion. The day was ending, and the English summer would also come to a close very soon.

It so transpired that Charles Singer's life was likewise hastening to a close, for death reached him before the next midsummer. But just as the sun in that delightful Cornish setting was not extinguished, and just as another summer was inevitable, so Charles Singer is still amongst us, remembered for his example and his thoughts perpetuated in his many writings.

Notes and Events

Edited by Dorothy M. Schullian*

The M.R.C.S. Certificate of Sir Ronald Ross (1857-1932).

Ronald Ross was born on 13 May 1857 at Almora in the Himalayas, the son of General Sir Campbell Claye Grant Ross, and in 1865 he was sent to school in England. He signed on as a medical student at St. Bartholomew's Hospital, London, on 29 October 1874, when his home address was given as Southsea Villa, Southsea; he became a resident student in the College. Ross had wanted to become an artist and was also keenly interested in mathematics and poetry. It was his father who decided that he should study medicine (with a view to his eventually entering the Indian Medical Service), which probably explains why the son appears to have neglected his studies. Three days before the examination for the Membership he decided that he should be coached by a studious friend. Ross passed, but the friend failed! Unfortunately, he was not so lucky with the examination of the Society of Apothecaries. Ross records in his *Memoirs* (1923) that he decided to read for his L.S.A. only on the morning of the examination and had insufficient time to study poisons and their antidotes. The *viva voce* was concerned with the latter, and Ross failed. This prevented him from competing for the I.M.S. in 1879, and his father threatened to cut his allowance. Ross signed on as surgeon to a ship running between London and New York, and continued studying for the examination during voyages. His father retired in 1880 and returned to England. Ross passed the L.S.A. early in 1881, following which he qualified for the Indian Medical Service and sailed for India on 22 September 1881.

This brief outline of his early medical education and setback suggests that, having been forced into a profession not of his own choice, Ronald Ross fostered a grievance for the remainder of his life. That he later achieved success and eminence in his profession reflects creditably upon his courage. However, the bitter controversies and the antagonism towards workers in the same field which are revealed in his *Memoirs* and numerous other writings portray Sir Ronald Ross as a disappointed man with an exaggerated view of his own work as compared with that of others. He achieved some success as a novelist, poet, and mathematician, and would probably have preferred to be able to spend more time on these activities.

The Membership certificate here reproduced is dated 30 July 1879 and gives Ross's place of residence as Peshawur, India, probably because his

* Curator, History of Science Collections, Cornell University Library, Ithaca, New York.

Know all Men by these Presents:

That We The Court of Examiners of The Royal College of Surgeons of England have deliberately examined Mr Ronald Ross and have found him to be fit and capable to exercise the Art and Science of Surgery.

We therefore admit him a Member of the College.

In Witness whereof We have subscribed our Names and have caused the Common Seal of the College to be affixed hereunto.

Dated the Thirtieth Day of July in the Year of our Lord One Thousand Eight Hundred and Seventy Nine

John Hilton President

John Sue Vice Presidents

F. Bedford Clarke | John Marshall
Wm S. Savory | Timothy Holmes
D. B. Curling | J. Cooper Forster
John Birkett |

Names and Residence of Member. Ronald Ross Gorhampore India

Enrolled by Edward Senr

No 14 832

FIG. 1. M.R.C.S. Certificate of Sir Ronald Ross. (*Photograph by courtesy of Dept. of Medical Photography, St. Bartholomew's Hospital, London*).

father was stationed there at the time. It bears the signatures of Luther Holden (1815-1905) as President of the Royal College of Surgeons of England, [Sir] John Eric Erichsen (1818-1896) as Vice-President, Frederick LeGros Clark (1811-1892), [Sir] William Scovell Savory (1826-1895), Thomas Blizard Curling (*c.*1811-1888), John Birkett (1815-1904), John Marshall (1818-1891), Timothy Holmes (1825-1907), and John Cooper Forster (1823-1886). The certificate is housed in the Medical College Library, St. Bartholomew's Hospital, London.

JOHN L. THORNTON

*A Fifteenth-Century Prescription**

Published papers and documents of wide range will often include items of interest to the medical historian. In letters of the Stonor family I chanced recently on a prescription of the fifteenth century which, written with the abbreviations common to that and earlier periods and with certain symbols still in use today, demonstrates the relationship which existed at that time between physician and apothecary.

The prescription was written by the physician, William Goldwin,[1] to John Byrell, a London apothecary, for the use of Lady Stonor;[2] it reads as follows:

℞. Sir[roporum] ros[arum], epatic[e], mirtillor[um], an^{a} ℥iij. endiuie, compot. berberis, an^{a} ℥iiij. aq[uarum] pocculat[arum] de stipiti[bus] ros[arum], pla[n]tag[inis], mirtillor[um], acedule, an^{a} ℥ij. absinthii, folior[um] quercus, an^{a} ℥jss. endiuie ℥iiij. comisc[eantur].[3]

℞. ol[e]or[um] rosar[um], mastic[is], absinthii, Cicomor[um], an^{a} ℥jss. mirtini ℥. aceti ʒj. commisc[eantur].[4]

* Research aided by a grant-in-aid from the Huntington Library.

1 William Goldwyn (Goldwin, Goldewyn) was a bachelor of medicine from Oxford. He had been a fellow at All Souls College in 1455 but was not given permission to incept in medicine until 1479-1480. He died in 1482. See A. B. Emden, *A biographical register of the University of Oxford to A. D. 1500*, Oxford, University Press, 1957-1959. II, 787.

2 *The Stonor letters and papers, 1290-1483*, edited by Charles Lethbridge Kingsford. London, Camden Society Publications, 3d ser., vols. XXIX-XXX, 1919, II, 107-108. The Stonor family had been located at Stonor in Oxfordshire since 1290. This letter was dated by Kingsford as above 1480, i.e. 12 June 1480.

3 The abbreviation ℞ stands for *Recipe* and an^{a} for Greek 'ana, which can be translated "to the amount of." The symbol ℥ was even at this time the standard symbol for ounce; ℥ss stands for semissis, or half ounce. A photographic reproduction of the manuscript is included in the printed documents. I have followed Kingsford in expanding the abbreviations used by Goldwyn and differ with him only slightly. The first prescription calls for a mixture of rose, hepatica, or liverwort, and myrtle syrups to the amount of ʒ ounces; lettuce mixed with berberis to the amount of 4 ounces; a cup of water steeped with rose, plantain, myrtle, and acetosa (sorrel) to the amount of 2 ounces; absinthe and oak leaves to the amount of one-half ounce, and 4 ounces of lettuce. For identification of the various plants, I have utilized John Parkinson, *Theatrum botanicum: the theater of plants*, London, Tho. Cotes, 1640, which is invaluable.

4 Mix thoroughly rose oil, mastic (i.e., probably *Pistacio lentiscus*, an evergreen shrub of the Levant), absinthe, and wild figs to the amount of one-half ounce; one ounce of myrtle oil, and one ounce of vinegar.

℞. masticis ℥j. pulu[er]izet[ur] subtilit[er] et ponat[ur] i[n] cophino paupiri mu[n]dissimi.[5]

℞. man[us] ch[ris]ti ℥ij.[6]

Syr, I recommande me unto yow, prayng yow as hertely as I may [th]at ye have over syȝthe in [th]e serving of [th]ys byll, as my truste ys in yow: for [th]ys ys for a spcyall Mastres of myn. And with [th]e grace of God hit schall not be longe or I see yow. And [th]en I purpose for to tary with you. Wrtyn at Sonter [th]e xij day of June.

Mr. W. Goldwyn.

To John Byrell [th]e eldur, Poticary, Duellyng in Bucklers Bury, be [th]ys byll delyverde.[7]

The prescription, however, did not end the matter. A little more than a month later, the good physician wrote to the Lady Stonor:

Right worschypful and to me Synguler good lady, I recommende me unto you: praying yow to sende me a buck a Wedynsday next commyng accordyng to [th]e promyse that my Master and ye made at my laste beyng with you: for a specyall frend of myn schall be maryde on Thursday nexte commyng, to [th]e wyche I have promysyde a buck: wherfor I pray yow [th]at he be not dispoyntyd. And my service schall be [th]e more redyer to yow at all tymys with [th]e grace of God, wyche have yow in kepynge. Wryttyn in haste [th]e xviij day of Jule,

By your servant, William Goldwyn

Madam, I pray yow to speck to my Master for [th]e xvj. li [th]at ys dew unto me.

To my lady Stoner, Be thys delyverede in haste.[8]

Perhaps the sixteen pounds also included the services of the apothecary and other visits by Goldwyn himself, but it is nonetheless a rather steep fee for the time.

VERN L. BULLOUGH

Historical Notes in the AMERICAN JOURNAL OF CARDIOLOGY

The series of historical notes which has been appearing in the *American Journal of Cardiology* since 1958 will be continued during 1962. The twenty-five notes which were published during 1958-1961 were listed in *J. Hist. Med.* (1959, *14*, 90-91; 1960, *15*, 85; 1961, *16*, 77-78).

The following are scheduled for 1962:

Coarctation of the Aorta (Albrecht Meckel, 1827) — February.
Coarctation of the Aorta (Reynaud, 1828)—April.

[5] One ounce of mastic. Pulverize carefully and place in a container of clean paper.
[6] I am indebted to Professor Joseph Ewan of Tulane University, a fellow reader at the Huntington Library, for his suggestion that this might be the rather common *Palma Christi*, or great Spurge, a common medieval purgative. The whole prescription is strongly purgative.
[7] The th in brackets appears as "the symbol thorn" in the document.
[8] *The Stonor letters and papers*, II, 110. The date on this would be 18 July 1480.

An Early Review of Laennec's Treatise—June.
Coarctation of the Aorta (Legrand, 1833)—August.
The Examination of Recruits in the Civil War (Bartholow, 1863)—October.
A Review of John Forbes' Translation of Laennec—December.

Each article reproduces, completely or in part, a document which illustrates some aspect of the development of cardiology. In each instance the text is accompanied by explanatory material designed to develop the historical implications of the original.

The series is intended to arouse in at least an occasional cardiologist an interest in the development of his *métier*.

SAUL JARCHO

"A Cordial Old and Rare"

On 24 June 1961 the career of Andrea Corsini, beloved dean of medical historians and eminent hygienist, was closed by death. Born at Florence in 1875, he had served with great distinction as professor at the University of Florence, Director of the admirable Museo di Storia della Scienza whose collections he had been so instrumental in amassing, and Director of Hygiene for his native city. His publications in both the history of medicine and hygiene are numerous and substantial. Shortly before his death a non-medical work on which he had spent many years, *I Bonaparti a Firenze,* was published by Leo S. Olschki of Florence as volume II of the Biblioteca dell'Archivio Storico Italiano. Those fortunate enough to have known Professor Corsini will always remember the essential goodness of his character and his outstanding kindliness and gentleness. He was for many years Consulting Editor to the Journal.

In the death of Humphrey Thomas Pledge on 28 December 1960 the Science Museum Library in South Kensington lost the man who had played a leading part in its administration through the years and in recent plans for its reorganization. Born in 1903, Mr. Pledge joined the library's staff in 1928 and was appointed Keeper in 1945. His official duties left him little time for the research and writing for which he was so well equipped, but historians will long find useful his *Science since 1500; a Short History of Mathematics, Physics, Chemistry* [*and*] *Biology* (London, 1939) and his article "Symbolism as a Limiting Factor in the History of Science" in *Science, Medicine, and History. Essays . . . in Honour of Charles Singer* (Oxford University Press, 1953), 2, 450-459. Typical of his feeling for history and of the original cast of his mind are the first two sentences of this article: "The study of symbolism needs, it is hoped, no apology. But it needs great caution."

Bert G. Anderson, D.D.S., died on 15 June 1961 at his home in Branford, Connecticut. Dr. Anderson was born in Litchfield, Minnesota, in 1888 and served successively in the fields of dentistry and oral surgery at

the University of Minnesota, Peiping Union Medical College, Columbia University, and, from 1931, the Yale University School of Medicine. His special interests were dental caries, malocclusion, and periodontal disease, and, surrounding and permeating them all, history. Readers of the Journal will recall his article on the teeth of Colonial Americans in the volume for 1956, *11*, pages 221-224.

Professor Alberico Benedicenti died on 2 February 1961 at the age of 95. Born at Mondovi in 1866, he taught pharmacology at the universities of Camerino, Cagliari, Messina, and Genoa and was connected also with pharmacological institutes outside Italy. In this country he was perhaps best known for his work *Malati, medici e farmacisti,* in two volumes, which was first issued at Milano in 1924-1925 and is a classic in the history of pharmacology. Professor Benedicenti was a member of the Accademia dei Lincei.

William J. Bishop, F.L.A., died at his house in Cheam, England on 27 July 1961, aged 57. From 1924 he had served, in various capacities, the libraries of the Royal College of Physicians, the Royal Society of Medicine, and the Royal College of Obstetricians and Gynaecologists. He had retired in 1953 from the librarianship of the Wellcome Historical Medical Library (held since 1946) to pursue his own researches full time. An outstanding librarian, he gave of himself unstintingly to his profession where his wide knowledge and shrewd judgment will be sorely missed.

Mr. Bishop was well known to medical librarians and historians on this side of the Atlantic as much for his generosity with help and advice as for his services to scholarly research in medicine. Of his publications, which cannot be tallied here, the most recent, his widely known *Early History of Surgery* (1960). His work of seven years for the Florence Nightingale International Foundation on the complete calendar of her worldwide correspondence (*c.* 20,000 letters) was nearly completed; his *Bibliography of Florence Nightingale* will shortly be published. He had also been engaged for many years on a Dictionary of British Medical Biography. Since its inception in 1957, Mr. Bishop served as Editor of Medical History, the only British journal in this field. In all of these ways he has won many friends and his name will continue to be mentioned with admiration and gratitude by all those associated with medical history and research.

Anibal Ruiz Moreno, who died in December 1960, was born in Cordoba (Argentina) in 1907. He had combined the practice of medicine (specializing in treatment of rheumatism) with the history of medicine, distinguishing himself in both fields. He began teaching in 1937 at the Medical School of the University of Buenos Aires, became Professor in 1947 and chairman of the department the following year. At his death, he was Professor of the History of Medicine at the Universidad de la Plata as well. He was also President of the International League against Rheumatic Diseases.

Ruiz Moreno published some 29 books or monographs and 61 papers on medical history in addition to a standard work on rheumatism (1936), now in its 7th edition, and 160 papers dealing with rheumatic diseases. Among his historical works were Spanish versions of Galen's work (1947), the treatises of Rhazes on smallpox and measles (1948), and the *Regimen Sanitatis Salernitanum* (1951); he was working on further translations of Galen and of Fracastoro's *De Contagione,* which are left unfinished.

Dr. Ruiz Moreno paid several visits to the United States seeking out medical historians and libraries. The warm friends he made here can well appreciate that his premature death has removed a vital force in the history of medicine and they share in the loss so deeply felt in his own country.

The Logan Clendening Travelling Fellowship

The Logan Clendening Travelling Fellowship in the History of Medicine, in the amount of $1,000 and tenable for three months during the summer of 1962, is open to registered medical students of any recognized medical school in the United States and Canada and also to college seniors already accepted by any such school. Application forms may be obtained from Dr. L. R. C. Agnew, Chairman, Department of the History of Medicine, The University of Kansas Medical Center, Kansas City 12, Kansas; the forms, with details of proposed projects, must be returned to him by 1 April 1962.

New Appointments

Dorothy M. Schullian, editor of Notes and Events and formerly Chief of the History of Medicine Division, National Library of Medicine, is now Curator of the History of Science Collections at Cornell University Library, Ithaca, New York. Contributors to Notes and Events are urged to send their communications to her at the new address.

John B. Blake, formerly Curator of the Division of Medical Sciences, Smithsonian Institution, has been appointed Chief of the History of Medicine Division, National Library of Medicine.

Whitfield J. Bell, Jr., formerly Associate Editor of the Papers of Benjamin Franklin at Yale University, took up new duties in Philadelphia on 1 July as Associate Librarian of the American Philosophical Society. Dr. Bell has been an Editor of this Journal since April 1958 and also serves as a member of the Board of Managers.

Symposium Internazionale di Storia della Neurologia

A symposium on the history of Italian neurology was held at Villa Monastero, Varenna, 30 August – 1 September 1961. The secretary was Luigi Belloni, Professor of the History of Medicine at the University of Milan, who discussed the neurological work of Domenico Cotugno. American and British participants, with their subjects, were Charles D. O'Malley,

"Studies of the Brain during the Italian Renaissance"; Dorothy M. Schullian, "Domenico Cotugno as Humanist"; Mary A. B. Brazier, "Fontana: Scientist of the Trentino"; Kenneth D. Keele, "Leonardo da Vinci's Studies of the Central Nervous System." On 31 August there was an excursion by boat to Bellagio and Como and the Tempio Voltiano. It is hoped that since the International Congress of Neurology, which met this year in Rome, is held in successive years in other countries, similar historical symposia can be arranged for those countries.

III Centenario della Nascita di Antonio Vallisneri

The University of Padua and the Accademia Patavina di Scienze, Lettere ed Arti celebrated the third centenary of the birth of Antonio Vallisneri with a symposium 29 September – 1 October 1961 on the subject "The Experimental Method in Biology from the Time of Antonio Vallisneri to the Present." American and British participants, with their subjects, were Howard B. Adelmann, "La prima epistola di Marcello Malpighi sui polmoni: la sua base sperimentale e l'influenza di Giovanni Alfonso Borelli sulla sua produzione"; Paul Weiss, "Experience and Experiment in Biological Research"; A. C. Crombie, "Problems in the Discovery of the Formation of the Retinal Image"; A. Dickson Wright, "The Biologists Who Have Exerted an Influence on Vallisneri's Work"; J. E. Young, "How Can the Memory of the Nervous System Be Studied?" On 1 October there was an excursion to Mantua and to Reggio Emilia.

Book Reviews

KERÉNYI, C. *Asklepios. Archetypal Image of the Physician's Existence.* (Translated from the German by Ralph Manheim.) Bollingen Series LXV. 3, New York, Pantheon Books, 1959.

Reviewed by EDWIN S. CLARKE, *Assistant Professor of the History of Medicine, Institute of the History of Medicine, Johns Hopkins University, Baltimore, Maryland.*

THE controversy concerning the role of Asclepius and his cult in the history of ancient Greek medicine has continued for centuries. The discovery of the inscriptions at Epidaurus in 1883 was an incentive for more intensified discussion, but as yet the problem has not been solved completely.

Professor Kerényi, who was formerly Professor of Classics and of the History of Ancient Religion in the universities at Szeged and Pécs in Hungary, and now resident in Switzerland, first gave his contribution to this topic in 1947 in a work entitled *Der göttliche Arzt: Studien über Asklepios und seine Kultstätten* and also in French, *Le Médecin divin.* A new edition appeared in 1957 and the present work is a revised and expanded version. It is Volume III of a series dealing with archetypal images in Greek religion, although it is the first to be published.

In the past, scholars attempting to explain the origins of Asclepius have largely depended upon the evidence found in Homer. Professor Kerényi castigates the Edelsteins and Hausmann for doing so, and for inventing imaginary lines of development which do not extend further back than Homer. But these authors have presented a remarkable collection of sources from literature, inscriptions, and religious monuments, and any criticism of their conclusions does not necessarily militate against the integrity, excellence, and over-all value of their work.

Rather than relying entirely upon factual information, Professor Kerényi employs mythology to trace the shadowy beginnings of the Asclepian cult. He insists that Asclepius' birth is a repetition of an un-Homeric, and certainly pre-Homeric, mythologem and this antedating of the legend gains some support from the recent decipherment of the Mycenaean writing. The popular legend of Asclepius' birth is considered in detail and the variations on the standard theme are discussed. The author's main thesis is that Asclepius was one of the aspects or manifestations of his father, the god Apollo, associated closely with the rising sun, a great symbol of nature contained in the mysterious divine principle which the Asclepiadae of Cos, for example, revered in their family cult. At the same time he had all the ideal qualities of the healing deity: "a divine physician, who combines light and helpfulness in his person, is Asculapius, ancestor and prototype of all mortal physicians."

Kerényi's approach to the myth is certainly a refreshing one because instead of being burdened by the heritage of 19th century mythology, he goes back to the ancient sources and adapts the useful technique of taking the reader on a guided tour of the main sites and sources of the cult: Rome, Epidaurus, Cos, Homer's *Iliad,* and Thessaly. This topographical approach is probably the most valuable aspect of the book; the descriptions are accurate and the illustrations excellent, the whole book being a praiseworthy example of book production. It concludes with an attempt to account for the labyrinth in the sanctuary of Asclepius at Epidaurus, and the author produces evidence suggesting that it was used for rearing the snakes of the healing cult. The whole work is well documented with notes gathered at the end, followed by a list of sources used (where there are, however, several surprising omissions), and an adequate index.

However, in his other works on mythology, Professor Kerényi is often guilty of strange fantasies with stranger misinterpretations of texts quoted, together with a loose association of ideas and facts. These criticisms can also be levelled at the book under review, where some of the conclusions arrived at are not warranted by the evidence available. An example of this is in the chapter on *The Sons of Asklepios on Kos,* where he discusses the relation of Hippocrates and the Asclepieion. He concludes that the medical school of Cos was established first and that it was only later that the religious influence of Epidaurus was felt, a contention which few will accept. There are several instances of similar, quite unjustifiable, deductions. Furthermore, he occasionally introduces allusions to Jungian symbolism which do not help to enhance the value of his work.

This book, despite its title, tells little of the activities of the individual Greek physician, and the procedures in the Asclepieia are not dealt with in detail. It is intended for those who already have some detailed knowledge of these aspects of ancient Greek medicine, and the reader must furthermore be well versed in the complexities of Greek mythology.

Until more incontrovertible evidence is available, most of us will be content to accept Hesiod's Thessalian saga of Asclepius as presented, for example, by Sigerist in *The Great Doctors,* where an account of the Asclepieia and their relationships with the present day is also given.

H. M. W. DE JONG. *Demonische Ziekten in Babylon en Bijbel.* Leiden, E. J. Brill, 1959, xvi, 131 pp.

Reviewed by MARTIN LEVEY, *Research Associate, Department of the History of Science and Medicine, Yale University School of Medicine.*

MANY magical practices known in the Near East today were in use by the inhabitants of ancient Mesopotamia. Many of these were borrowed by the Hebrews and other dwellers in Syria and Persia from their neighbors on the Tigris and Euphrates. In turn, the early Semitic people of Babylonia who

spoke Akkadian had earlier adopted much of the Sumerian culture including its vast stock of ideas on magic and the evil spirits. The latter took place largely in the third millennium B. C.

Spirit and ghost lore and belief were closely associated with the development of early medicine in the fourth millennium B.C. and later Sumerian and Akkadian literatures. One form of ghost known to the Sumerians and still recognised in the Near East today is the woman who died in childbirth and returns to seek her child. From this example it is easy to see how the names of demons and ghosts became associated with illnesses of the ancients.

The author has explored this and other facets of Biblical and Babylonian demonic medicine in the ancient literature. As a result, he has clarified our understanding of protohistoric medicine and its early mixture with empirico-rational procedures. Dr. De Jong has given a carefully balanced account of the various types of demons, and the development of the Evil Spirit idea in relation to medical prognosis, diagnosis, and therapeutics. Fully treated, in addition to the Babylonian demonry, are similar examples in the Old Testament, the Apocrypha, and in the New Testament. Included are some interesting accounts of the demonic medicine of Jesus, Saul, Sarah, Paul, and that found in Flavius Josephus.

An excellent selected bibliography is included. This work is highly recommended by this reviewer as a *sine qua non* for all who have an interest in the early phases of the development of medicine.

VILHJALMUR STEFANSSON. *Cancer: Disease of Civilization?* New York City, Hill and Wang, Inc., 1960. xi, 180 pp. $3.95.

Reviewed by ARNOLD D. WELCH, *Eugene Higgins Professor of Pharmacology and Chairman of the Department, Yale University School of Medicine.*

THIS book comes as near to being a work of science as this thoughtful and remarkable man (of over 80) could write about a subject concerning which it is almost too late to obtain data. Stefansson's thesis is that many types of relatively primitive human beings, who were not exposed to a variety of traumatic effects of "civilization," apparently almost never experienced cancer in any of its nearly innumerable forms. His evidence is taken not only from his own records, made during Arctic expeditions early in the 20th century, but also from a vast knowledge of the writings of many other careful observers of the ways of life of primitive peoples. Although particular attention is paid to the colder regions of the earth, concerning which Stefansson's personal knowledge indeed is great, comparable impressions also have been gained from various writings of McCarrison, Wrench, and Banik (concerning the Hunzas of northern India), Schweitzer (Gabon in Africa), Hrdlicka (Bolivia), and others. Particularly impressive statistics have been obtained from a study of F. S. Fellows of the U.S. Public Health

Service, who examined the incidence of "malignancy" during a five-year period (1926-1930) among whites versus natives in the four judicial districts of Alaska, in which the order of penetration of "civilization" apparently can be stated with considerable accuracy. It is remarkable that the cancer rate of the districts (in percentage) drops from the highest (the "First District" and the first to be "civilized") to the lowest (the "Fourth District" and the last to be exposed to "civilization") from 7.8 (white) and 2.8 (native), 6.0 and 1.4, 10.8 and 0.8, to 8.4 and 0.1.

Although many factors doubtless could be involved causally in what appears to be an acceptable conclusion, viz., that many groups of primitive men were free or nearly free of cancer, it is Stefansson's conviction that the fundamental difference between primitive and civilized peoples is a nutritional one. Although some writers (e.g., McCarrison) have put the main weight on the hazard of diets high in meat, as compared to those which are largely vegetable in nature, Stefansson has indicated clearly that this cannot be true, since the northern peoples had originally but little access to vegetable sources of dietary materials. Rather, emphasis is placed on the long breast-feeding of infants, the extensive use of raw or very lightly cooked fish and meats, and the degree of (more recent) dietary exposure to such characteristic foods of civilization as high carbohydrate products, highly altered grains, various canned or chemically preserved foods, sugar (as such), as well as to salt in amounts not used by primitive peoples.

In the light of the rapid advancement of man's knowledge of the role which viruses play in carcinogenesis (at least in animals), this reviewer may be permitted to reflect not only upon nutritional factors, but also upon a parallel to the shockingly obvious impact on primitive peoples of such infections as tuberculosis, measles, and smallpox, since ultimately these infections may prove to have been accompanied by less dramatically or promptly displayed "cancer viruses." In any case, Stefansson has written both wisely and well about a problem which at present seems to be the concern of only a minor segment of the now very large number of investigators of cancer in all its aspects. Despite the research orientation of this reviewer, he will agree wholeheartedly with the author of this book, that an ounce of prevention would be worth a pound of the cures which science seeks most intensively and, so far, only with the resultant satisfaction of great additions to basic knowledge and the development of a few agents which have temporary value in the treatment of some cases of certain types of neoplastic disease.

As with the problem of cigarette smoking, the most provocative probabilities are not easily reduced to certainties. Since the fear of lung cancer only once slightly dented the steadily rising curve of cigarette consumption, one wonders how much evidence concerning diet would be required to impress our civilization, and whether, under almost any imaginable conditions, the population, *en masse,* could be persuaded significantly to modify

its dietary habits, much less to change them in the ways which Stefansson's provocative book would suggest might be desirable. It is hoped, nevertheless, that this little book will help to focus interest upon a very important aspect of the cancer problem which has received altogether too little attention.

REMBERT WATERMANN. *Theodor Schwann, Leben und Werk.* Düsseldorf, Verlag L. Schwann, 1960. 364 pp., 70 figs., $9.00.

Reviewed by LOWELL E. NOLAND, *Professor of Zoology, University of Wisconsin, Madison, Wisconsin.*

IN writing this book the author had access to papers of the Schwann and Müller families and to portions of Schwann's research journals not previously studied. He begins with a short account of Schwann's life: born 1810 at Neuss, lower Rhineland; attended Gymnasium at Cologne; university at Bonn; medical school first at Würzburg, later at Berlin, where he received his medical degree in 1834; remained five more years at Berlin as assistant to Johannes Müller, who guided him into university teaching. In 1839 he became professor of physiology at Louvain, publishing his treatise on the cell theory shortly thereafter. In 1848 he transferred to Liège, where he spent the remainder of his scientific life. There he was honored by an international jubilee celebrating his fortieth year as professor. He died in 1882 while on a visit in Cologne. He travelled little, never married, gave most of his time to medical teaching and research in the universities where he worked. Some of his unpublished researches are known only from his meticulously kept research journals, which are fortunately still extant.

Schwann is best known as author of the cell theory (1839), which grew out of similarities observed between notochord and plant cells, and which he supplemented by studies of epithelium, cartilage, and other tissues. Schwann held that cells originated from a liquid "cytoblastoma" by a process similar to crystallization. He believed that "secondary cells" (e.g., muscle and nerve) might arise by fusion of chains of primary ones. Fibrous connective tissue, he thought, originated by intracellular development of fiber cells within pre-existing cells. In cell origin Schwann maintained that the nucleus formed first, the cell membrane next, and the cell contents last accumulated by the membrane. He did not see nuclear division (first reported by Remak in 1852). Johannes Müller was slow in accepting the cell doctrine, applying it first to interpretation of tumors. It was, however, promptly adopted by Henle (a fellow student of Schwann's under Müller) and was later applied in thorough-going fashion to pathology by Raspail and Virchow. In Chapter 12 Watermann discusses the cordial relationships between Schwann and Müller, showing how the latter helped his student by instruction, research suggestions, encouragement, and publication, without putting restraints on the development of his ideas.

Schwann's other researches included work on necessity of oxygen for development of chick embryos, mechanics (Schwann's law) of muscle action (decrease of contraction strength with shortening), discovery of pepsin and its activation by HCl, similarities between digestion and fermentation, disproof of spontaneous generation, origin and growth of blood vessels and nerve fibers including demonstration of Schwann's sheath on the latter, indispensability of bile, effects of starvation on metabolism as measured by oxygen consumption and CO_2 production, laws of action of the hydraulic screw pump, closed oxygen-circulating respiratory device for rescue work in mines (Watermann adds a brief history of the development of such devices), preparation of a stoichiometric table for physiologists, and many less extensive researches.

Besides his unifying concept of cellular organization, Schwann helped to strengthen the physico-chemical interpretation of physiological processes, in place of the earlier speculative "vital force" concept. He was, however, no materialist, but a very religious man, who firmly held to the freedom of the human will and its ability to enter causally into human behavior. In two final chapters are given some clinical observations made by Schwann (one on a diabetic who was probably Schwann himself), and a selection of reprinted letters illustrating Schwann's relations with his family, friends, administrators, and scientific colleagues. All in all, the author succeeds vey well in presenting Schwann's ideas and work in the context of contemporary thinking in his field.

LOGAN CLENDENING. *Source Book of Medical History*. New York, Dover Publications. Inc.; New York, Henry Schuman, 1960. xiv, 685 pp. $2.75.

Reviewed by THOMAS R. FORBES, *Acting Editor.*

THE increasing number of non-fictional and classic works now appearing in paper back editions is one of the satisfying developments in modern publishing. Dr. Clendening's important compilation was first printed in 1942. The well printed new edition is unabridged, sturdily bound even if paper covered, and inexpensive enough for almost any medical student to add to his library.

Short papers, and extracts from longer works, by 120 authors range from the medical papyri to Röntgen's *On a New Kind of Rays* (1895). The excitement of the penetrating observation, the accidental discovery, the shrewd conclusion, when told in the physician's own words is not lessened by the centuries. Paré's relief is still vivid as he learns that gunshot wounds heal far better with a bland dressing and that the patient can be spared the agony of the cautery. Pasteur saves the life of nine-year-old Joseph Meister, bitten by a rabid dog, and Semmelweis solves the deadly mystery of puerperal fever. Here too are several well-chosen medical passages from non-technical classics—the death of Ailie from *Rab and His Friends,* Dickens' caricature of the medical student, and Chaucer's wry picture of

the physician. Selections are well made and illustrate almost every aspect of medicine. Biographical sketches of the authors, suggestions for additional reading, and a suitable index round out a fascinating volume.

GIOVANNI BATTISTA MORGAGNI. *The Seats and Causes of Diseases Investigated by Anatomy*. With a Preface, Introduction, and New Translation of Five Letters by Paul Klemperer. New York, Hafner Publishing Co., 1960. 3 vols. $45.00.

Reviewed by FREDERICK G. KILGOUR, *Librarian, Yale Medical Library.*

THIS three-volume work of some 2,300 pages is the principal foundation of gross pathological anatomy and a medical classic of the highest rank. It first appeared with the title *De Sedibus et Causis Morborum per Anatomen* at Venice in 1761, the year Morgagni reached the age of 79; he was to live on for another ten years. Two years before Morgagni's death Benjamin Alexander translated *De Sedibus* into English, and it is Alexander's 1769 London edition which the Hafner Publishing Company has reprinted in facsimile. Alexander omitted the five letters which introduced each of the five books in the original edition, but Paul Klemperer has skillfully translated them for the present printing. The learned Dr. Klemperer has further embellished this second unabridged English edition with a Preface and Introduction.

Morgagni divided his work into five books, "Of Disorders of the Head," "Of Disorders of the Thorax," "Of Disorders of the Belly," "Chirurgical and Universal Disorders," "Of such Things as may be added to the former Books," and equipped it with four useful indexes. Seventy letters, the 18th century equivalents of modern articles, make up the five books. Morgagni wrote the letters to "a young gentleman, of strict morals and an excellent disposition, who was much given to the study of sciences, and particularly to that of medicine," and the author had in mind their "being afterwards revis'd and publish'd." Fortunately they were.

Morgagni's sources are principally his post-mortem examinations of a half century, his own and others' clinical observations, the notes of his great teacher, Antonio Maria Valsalva, and innumerable printed books. His work was a triumph of clinico-pathological description which Dr. Klemperer appraises as "the culmination of a gradual evolution of pathologic anatomy as well as the beginning of a new concept of pathology as it developed in the 19th and 20th centuries." Certainly *De Sedibus* was the most valuable single work on pathology prior to the appearance of Rudolf Virchow's *Cellularpathologie* a century later.

The facsimile republication of *The Seats and Causes of Diseases Investigated by Anatomy* is a most praiseworthy act. The original edition has long been an unavailable rare book. Still, in the Yale Medical Library no other book printed in the 18th century has been used more. Medical historians and humanists will welcome this new edition.

MUHAMMAD ZUBAYR SIDDIQI. *Studies in Arabic and Persian Medical Literature.* Calcutta, India, Calcutta University, 1959. xii, 173 pp., 7 plates. $5.00.

Reviewed by MARTIN LEVEY, *Research Associate, Department of the History of Science and Medicine, Yale University School of Medicine.*

DR. SIDDĪQĪ, who is the Sir Asutosh Professor of Islamic Culture in Calcutta University, is in an excellent position to study the manuscript sources of early Arabic medicine. India still has, in its depositories, some of the richest Arabic collections in the world. In addition, the early Muslim medicine of such great physicians as al-Rāzī and ibn Sīnā, is still taught in many medical schools using their texts. Further, ancient Arabic medicine is practised alongside the modern and other forms of medicine in all regions of India.

The work under review was originally meant to be published simultaneously with the edition of, and the introduction to, the text of the *Firdaus al-hikma*, a great medical work by Alī al-Tabarī c. 838–c. 923 A.D. Professor E. G. Browne had commenced it but owing to his death in 1926, his pupil, Siddīqī, carried on until its completion. The studies referred to in the title deal mainly with the research done by the author on this aforementioned work by al-Tabarī which, by the way, was the first independent Arabic medical compendium.

This compendium, whose chapter titles are given in full, is noted for the fact that Arabic medicine was stressed in spite of an elaborate inclusion of Aristotelian ideas. The system of Indian medicine is also discussed, as are matter, diagnosis, digestion, physiology, pathology, therapeutics, and pharmacology. Although brief, the discussion of the *Firdaus-al-hikma* is interesting and accurate.

Another important section of this book is concerned with Persian medical works produced in India such as Mian Bhowa's Ma'danu'l-shifā-i-Sikandarshāhī, the earliest Persian book on medicine written in India (1512 S.D.). Its material came largely from Sanskrit and Arabic sources. A full account of its contents is given.

Firishta (c. 1590), a famous historian, wrote the *Dastūr al-Atibba* or *Ikhtiyārāt -i-Qāsimi* which describes the Indian system of medicine at that time. Mediaeval Indian medicine is described at length by Siddīqī.

Hospitals in Muslim India have had a long history. Delhi which became the capital of Muslim India in 1210 A.D. was a rival of Baghdad. India was proud of its many scholars and physicians. Some of the Muslim rulers, like Muhammad ibn Tughluq and Fīrūz Shāh Tughluq, were interested especially in medicine. The former wrote a medical work entitled Tibb-i-Fīrūz Shāhi which contained material unknown to Avicenna in his *Qanūn*. During the reign of M. ibn Tughluq, there were seventy hospitals in Delhi alone.

Much information is to be found in Siddīqī's small volume on other phases of Indian and Arabic medicine and their relationship. Part of the

book is devoted to the general history of Arabic medicine. This is a field, unfortunately, in which no satisfactory account has yet been given.

The appendices are concerned with some clinical cases mentioned in the Arabic literature, medicaments, and some Arabic medical terms. There is an index and a list of many errata. The simples and Arabic medical terms are given in Arabic. The lists of terms are not complete nor are they entirely accurate. Thus they are of limited value.

Professor Siddīqī's book is a contribution to the history of Arabic medicine and should be useful in giving a brief, English summary of some major points in Arabic and Persian medicine.

Anales Chilenos de Historia de la Medicina, Santiago, Chile, 1959, Vol. I, 396 pp.

Reviewed by JAVIER SERVAT, *Resident in Ophthalmology, Yale University School of Medicine.*

THE official semi-annual organ of the Center of Investigation of History of Medicine of the University of Chile and the Chilean Society of History of Medicine is a well-written and highly documented publication which reflects a high level of medical knowledge. The most interesting part of the publication are the seven original articles inserted in its first portion:

"The Contribution of Fleming to Microbology" by Emiliano Armijo describes the work which Fleming did before the discovery of penicillin; and how the finding in 1922 of lysozyme, the antibacterial enzyme present in saliva, tears, etc. prepared him for giving to humanity one of the greatest contributions.

"An Operating Room in the 1800's" by Dr. Ignacio Gonzalez G. This is a description of the pre-antiseptic and pre-anesthetic era and its evolution, the contributions of Pasteur and Lister, the use of rubber gloves in Baltimore and the mask in Vienna by Mikulicz, the use of the cap, etc., with special reference to some of the Chilean surgical service at the beginning of this century.

"Something about the History of Appendicitis in Chile" by Dr. Adolfo Reccius. The paper describes the first appendicitis treated surgically (in 1894) in the Chilean medical literature by a Valparaiso surgeon, Olaf Page, a graduate of Yale University; and the first appendectomy done in Chile by Professor Ventura Carvallo in 1896.

"Father Feijoo in the Medical Thought of Spain" by Dr. Gregorio Lira. The struggle of the professor of the University of Oviedo in the 18th century to change the orientation of medicine in Spain in order to follow the direction of most European schools of medicine, his fight with the Catholic Church and conservative Spanish medicine.

"Doctors of Pirates, Corsairs, and Smugglers in Chile" by Dr. Enrique Laval M. This is an account of the legendary life of the ship's doctors on British pirate ships raiding the coastal cities of Ecuador, Perú, and Chile,

and how some of them went to Chile where they established good families and reputation. Among them Thomas Dover (Dover's powder).

"The Surgical Papyrus of Edwin Smith" by Dr. Joaquin Diaz G. is a lecture presented by the professor of the history of medicine of Caracas, Venezuela, to the Chilean Society of the History of Medicine relative to the Papyrus of Edwin Smith, its translation from the English version of J. H. Breasted to the Spanish by him and his friend Pedro Nicolás Tablante Garrido in 1943, and a review of its more interesting points.

"Electroanesthesia" by Dr. Claudio Costa. The discovery in 1882 by Ramon Araya Echeverria, a Chilean doctor, of this procedure, actually revived in some of the more important medical centers of the United States. This is the longest and most interesting of the seven original papers, comprising 220 pages, 8 diagrams, and 28 photographs.

The last part of the *Anales* contains notes of general interest. For subscription or information, write to Casilla 2609, Santiago, Chile.

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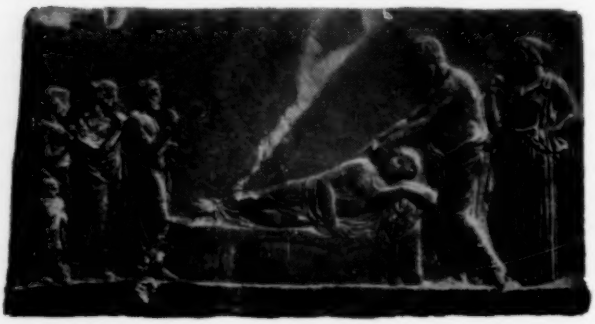

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